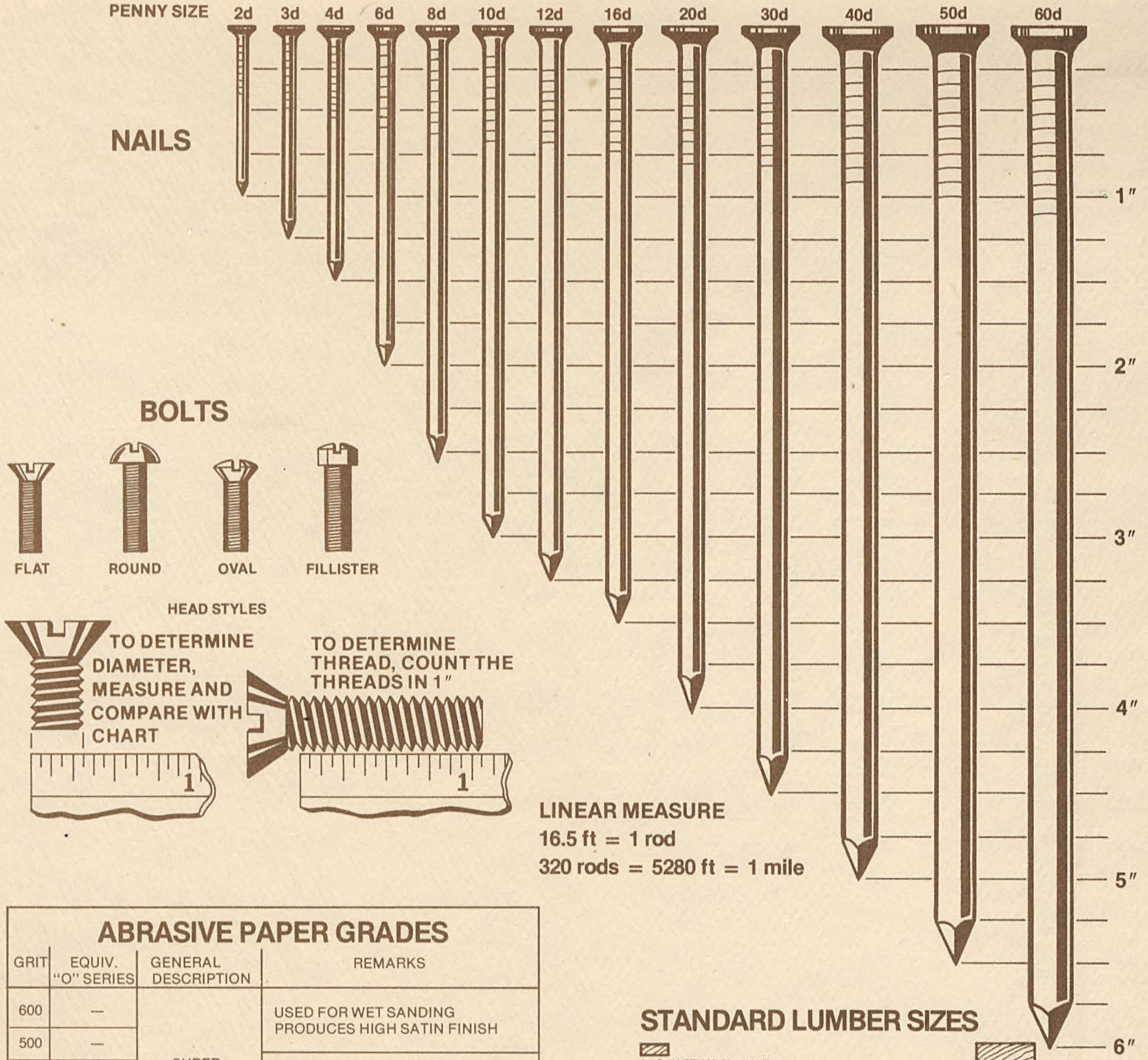
Popular Mechanics

do-it-yourself encyclopedia

SHOP GUIDE

NAILS

BOLTS


PENNY SIZE
2d
3d
4d
6d
8d
10d
12d
16d
20d
30d
40d
50d
60d
1″
2″
3″
4″
5″
6″
FLAT
ROUND
OVAL
FILLISTER
HEAD STYLES
TO DETERMINE DIAMETER, MEASURE AND COMPARE WITH CHART
1
TO DETERMINE THREAD, COUNT THE THREADS IN 1″
1

LINEAR MEASURE

16.5 ft = 1 rod

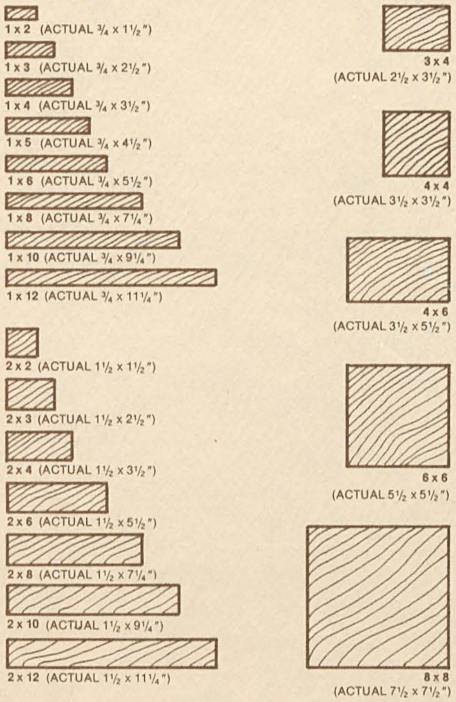
320 rods = 5280 ft = 1 mile

ABRASIVE PAPER GRADES

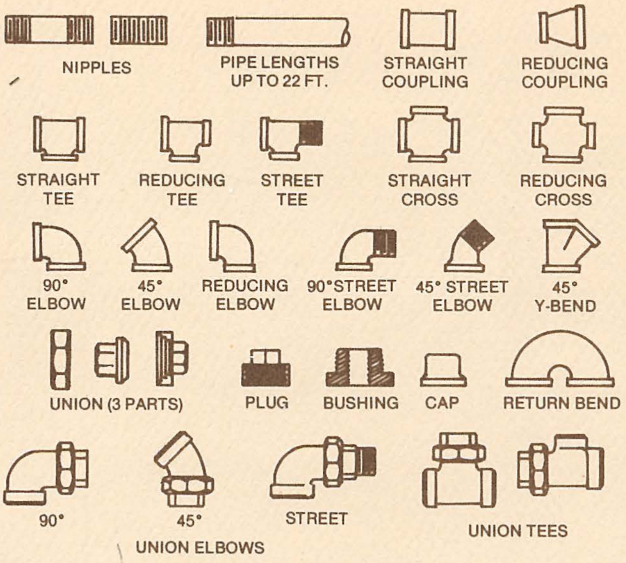
GRIT	EQUIV. "O" SERIES	GENERAL DESCRIPTION	REMARKS
600	—	SUPER-FINE	USED FOR WET SANDING PRODUCES HIGH SATIN FINISH
500	—		
400	10/0		GENERAL RANGE OF ABRASIVE PAPERS USED FOR WET SANDING LACQUER AND VARNISH TOP COATS
360	—		
320	9/0		
280	8/0	VERY FINE	USED FOR DRY SANDING ALL FINISHING UNDERCOATS. THESE GRADES WILL NOT SHOW SANDING MARKS
240	7/0		
220	6/0*		
180	5/0	FINE	FOR FINAL SANDING OF BARE WOOD. GOOD FOR SMOOTHING OLD PAINT
150	4/0*		
120	3/0	MEDIUM	USE FOR GENERAL WOOD SANDING. GOOD FOR FIRST SMOOTHING OF OLD PAINT, PLASTER PATCHES
100	2/0*		
80	1/0		
60	½*	COARSE	USE No. ½ FOR ROUGH-WOOD SANDING. No. 1 IS COARSEST PAPER WHICH CAN BE USED TO ADVANTAGE WITH PAD SANDER
50	1		
40	1½		
36	2	VERY COARSE	ALL TOO COARSE FOR PAD SANDERS. THESE GRADES REQUIRE HEAVY MACHINES AND HIGH SPEED TO CUT WELL
30	2½		
24	3		

Grades generally supplied as Very Fine, Fine, Medium and Coarse

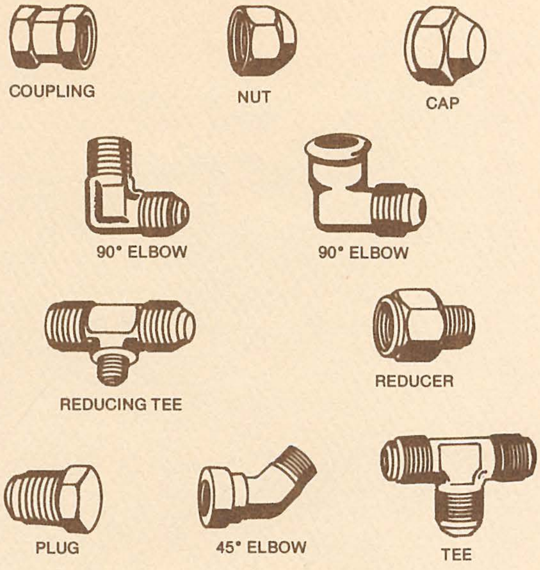
STANDARD LUMBER SIZES



PIPE FITTINGS



Here are the common steel pipe fittings. Nipples are simply short lengths of pipe threaded on both ends. Reducing fittings join two different sizes of pipe.



Compression fittings of the flared-tube type are the easiest for the novice to handle when working with copper tubing.

STANDARD STEEL PIPE (All Dimensions in Inches)					
Nominal Size	Outside Diameter	Inside Diameter	Nominal Size	Outside Diameter	Inside Diameter
⅛	0.405	0.269	1	1.315	1.049
¼	0.540	0.364	1¼	1.660	1.380
⅜	0.675	0.493	1½	1.900	1.610
½	0.840	0.622	2	2.375	2.067
¾	1.050	0.824	2½	2.875	2.469

SQUARE MEASURE

144 sq in = 1 sq ft
9 sq ft = 1 sq yd
272.25 sq ft = 1 sq rod
160 sq rods = 1 acre

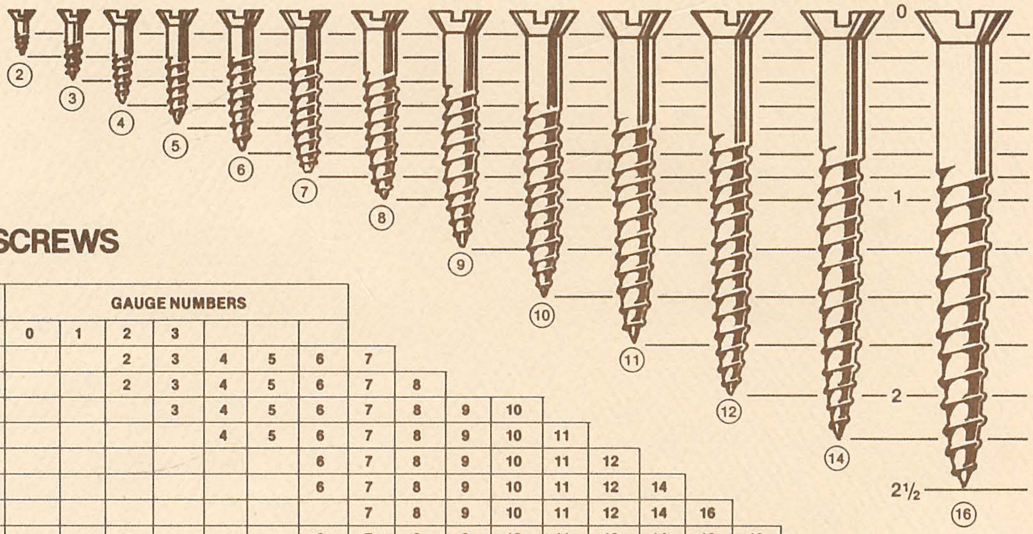
VOLUME MEASURE

1728 cu in = 1 cu ft
27 cu ft = 1 cu yd

MEASURES OF CAPACITY

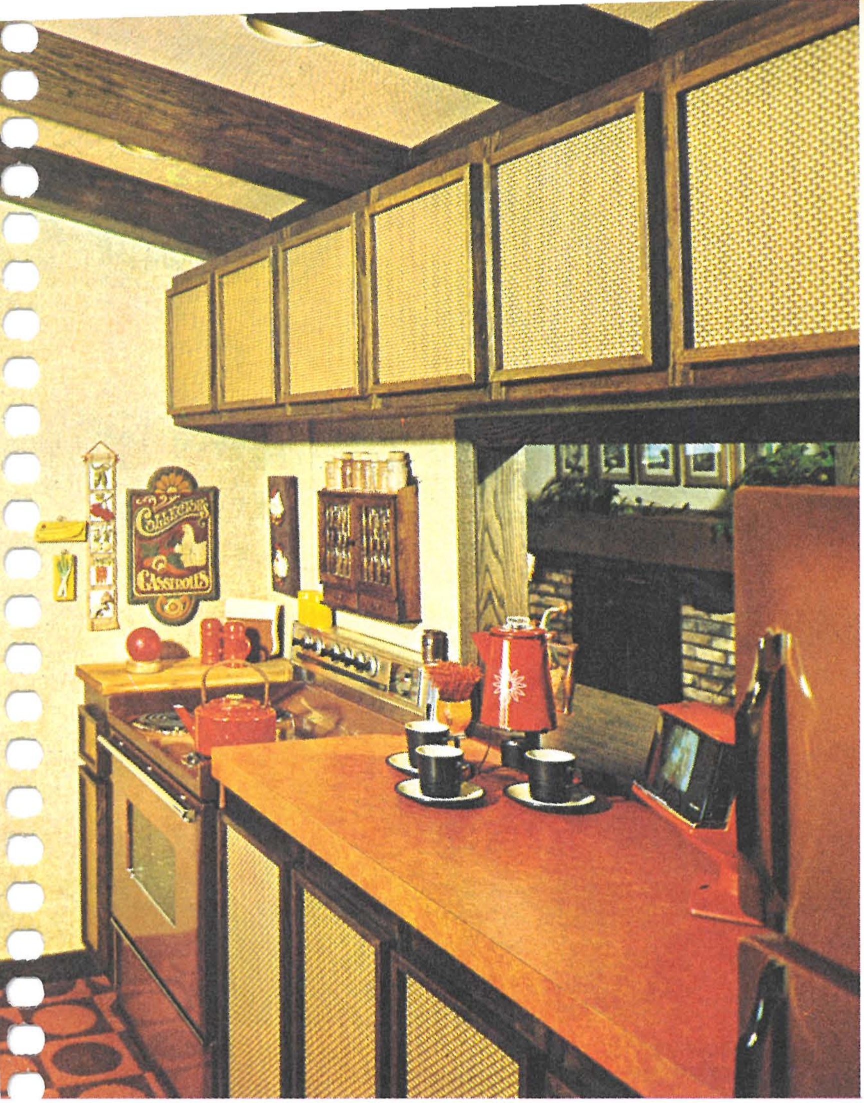
1 cup = 8 fl oz
2 cups = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon
2 gallons = 1 peck
4 pecks = 1 bushel

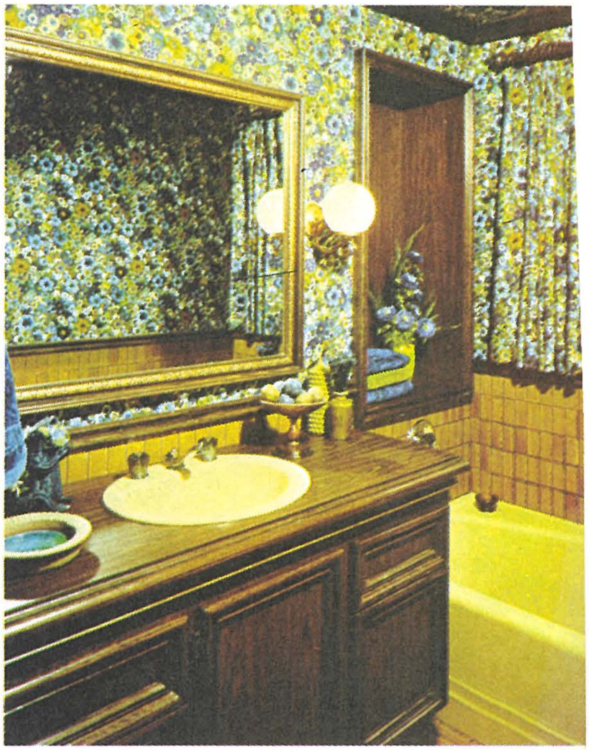
WOOD SCREWS

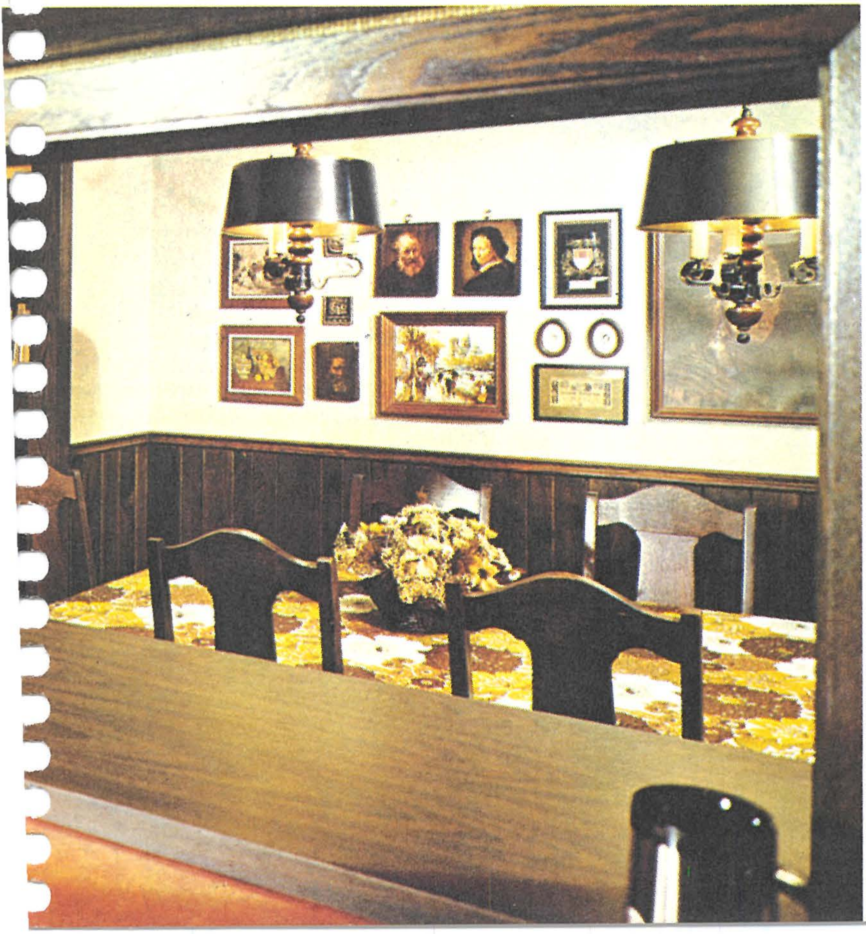


LENGTH	GAUGE NUMBERS																
¼ INCH	0	1	2	3													
⅜ INCH			2	3	4	5	6	7									
½ INCH			2	3	4	5	6	7	8								
⅝ INCH				3	4	5	6	7	8	9	10						
¾ INCH					4	5	6	7	8	9	10	11					
⅞ INCH							6	7	8	9	10	11	12				
1 INCH							6	7	8	9	10	11	12	14			
1¼ INCH								7	8	9	10	11	12	14	16		
1½ INCH							6	7	8	9	10	11	12	14	16	18	
1¾ INCH									8	9	10	11	12	14	16	18	20
2 INCH									8	9	10	11	12	14	16	18	20
2¼ INCH										9	10	11	12	14	16	18	20
2½ INCH													12	14	16	18	20
2¾ INCH														14	16	18	20
3 INCH															16	18	20
3½ INCH																18	20	24
4 INCH																18	20	24

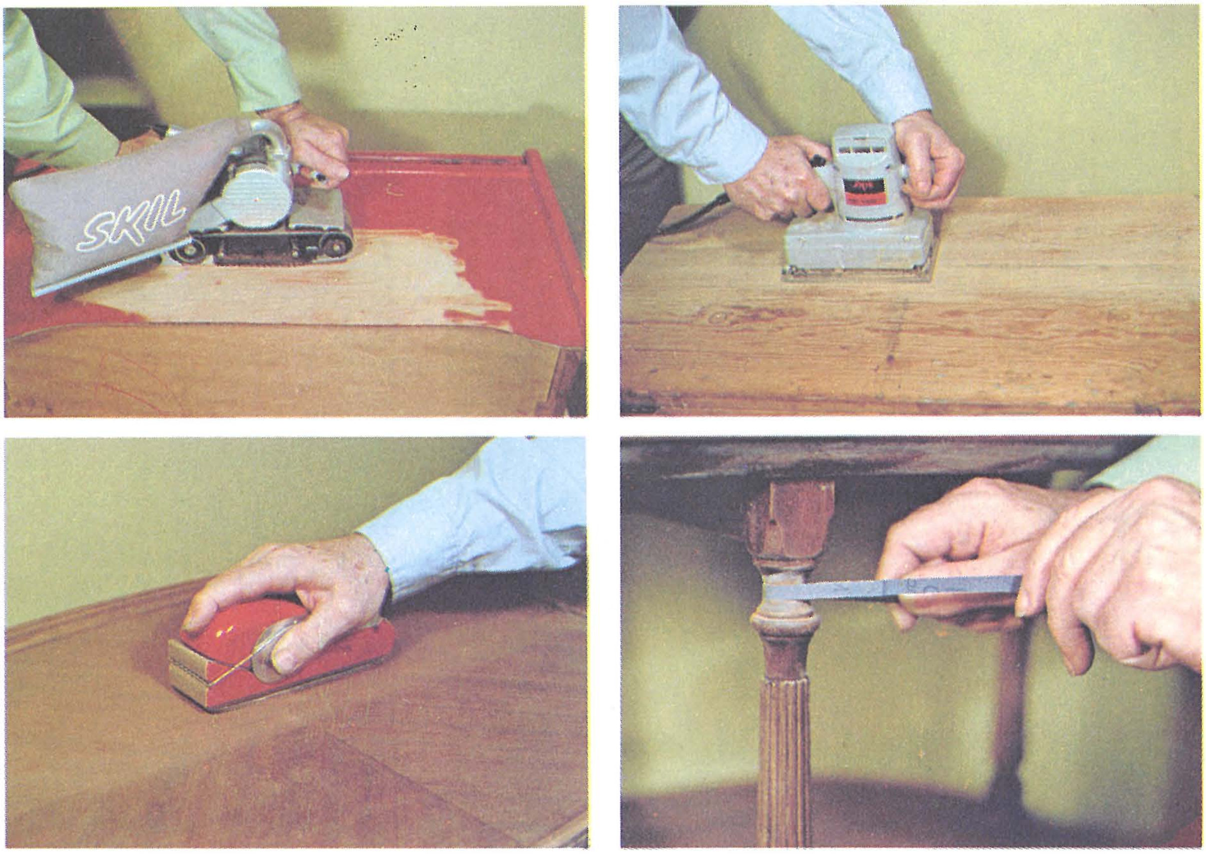
WHEN YOU BUY SCREWS, SPECIFY (1) LENGTH, (2) GAUGE NUMBER, (3) TYPE OF HEAD—FLAT, ROUND, OR OVAL, (4) MATERIAL—STEEL, BRASS, BRONZE, ETC., (5) FINISH—BRIGHT, STEEL BLUED, CADMIUM, NICKEL, OR CHROMIUM PLATED.







THAT HOUSE at the top of the opposite page was remodeled into the beautiful lakeside home shown just below. The other pictures on these pages show some of the stunning alterations that were made inside the home. You too can update an older home with dramatic changes that will make it more beautiful, more comfortable, and increase its value. See the galaxy of ideas on pages 2528 through 2563.

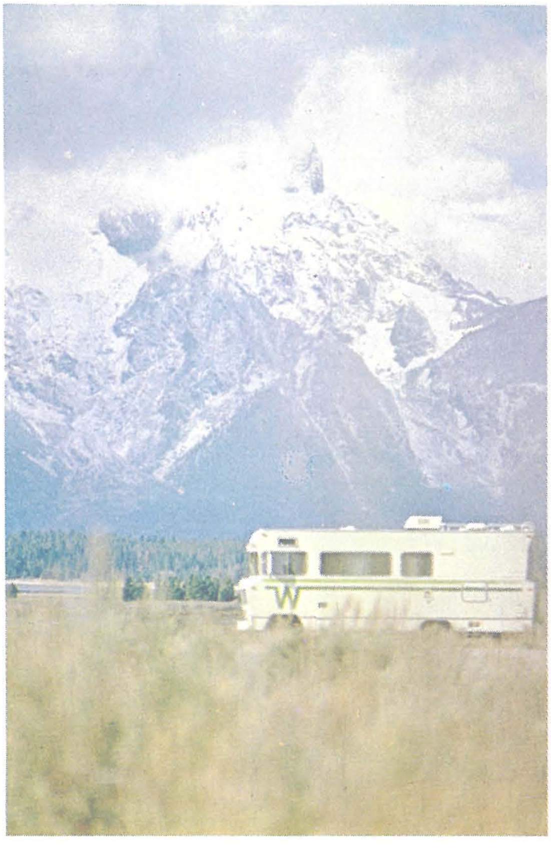


SANDING ALWAYS has been the most tedious shop job, but it's much easier now, thanks to new belt and pad sanders, and modern abrasives. Learn all about sanding on page 2641.

THIS COMFORTABLE loft room has been given an appealing nautical flavor by the addition of rope-hung shelves, a desk supported by block and tackle, kegs as seats, and a modern version of the old sea chest for storage. For more information on how the room was put together, see page 2539.

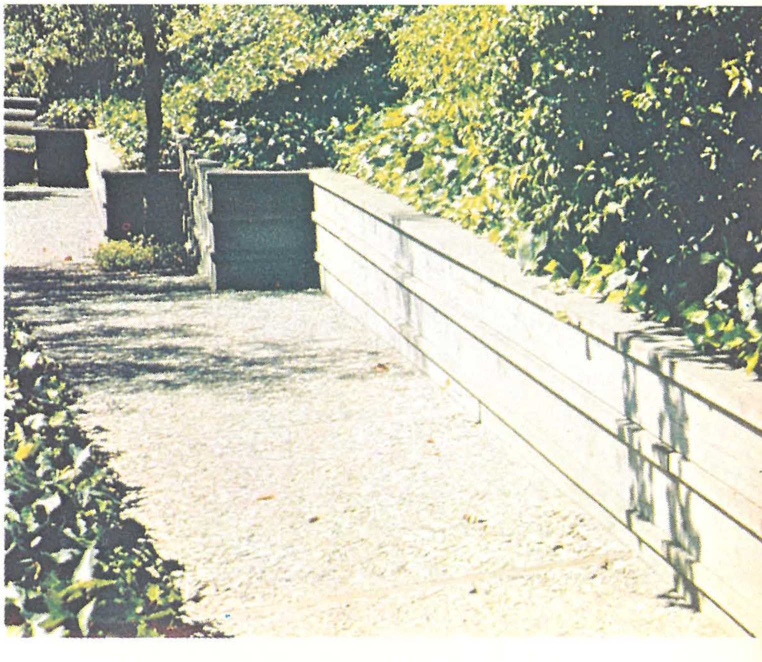
YOU'LL ENJOY YOUR RV days much more if you're a savvy RV pilot. On page 2500 you'll find some special handling—and equipment—tips that may help avoid trouble.

In this volume . . .



WILDERNESS DRIVING, in mountains or mountain meadows, has hazards all its own. Learn how to handle potentially troublesome situations in the article on page 2508.

THIS BEAUTIFUL retaining wall is faced with attractive redwood. On page 2564 you'll find plans for all kinds of retaining walls.



Popular Mechanics do-it-yourself encyclopedia

in 18 volumes

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- car maintenance
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volume 14

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Contents

recreational vehicles

How to be a savvy RV pilot 2500
How to handle 12 camping emergencies 2504
Tips on wilderness driving 2508
How to winterize your camper 2512
Smart ways to improve your recreational vehicle 2516
Checkups that keep your rig rolling 2520
How to buy or rent a used RV 2524

refrigerators

New look for an old refrigerator 2526

remodeling

Dramatic changes you can make yourself 2528
You can get a new home—without moving 2533
Room with a nautical flavor 2539
Ideas for add-on rooms 2540
New life for an old house 2542
How to update an old living room 2544

remodeling, exterior

New look for an old house 2549
Facelifting—cheapest way to get a 'new' home 2552

remodeling ideas

Great remodeling ideas 2556

retaining walls

How to build retaining walls 2564

riveting

Blind-side riveting 2568

rolling-pin catchalls

Rolling-pin catchall 2571

roofs

Be your own roofer and save half the cost 2572
Reroof with wood shakes and shingles 2576
How to prevent roof ice dams 2582
How to repair a damaged roof 2584

room dividers

Beautiful walls that serve a purpose 2586
How to light a freestanding wall 2590
Divide and conquer with a freestanding wall 2592

ropes, boat

All about boat ropes 2595

routers

How to use a router 2598

routers, accessories

A 'dial-a-jig' attachment for your router 2610
Make rotary cutters for your router 2612

rug hooks

A better rug hook 2615

rust, auto

Rust—your car's worst enemy 2616
Should you rustproof your new car? 2622

sabre saws

For versatility you can't beat a sabre saw 2626
A 'table saw' from your sabre saw 2632

sailboats

Sailing faster than the wind 2636

salt-and-pepper shakers

Salt-and-pepper cylinder 2638

sandboxes

A sandbox and play table 2639

sanding

Sanding from start to finish 2641

sawhorses

A simple-and-easy sawhorse 2648
Sawhorse becomes a workbench 2650
Sawhorse carries tools 2652

scaffolding

How to rent and work from scaffolding 2653
Build a mobile scaffold 2658

scrapers

Professional cabinetmaker scrapers 2660

screened summer rooms

Add a screened porch 2662
Your garage can be a screened porch 2668

screens

How to stretch screen wire 2670

screws

Choose the right screw for the job 2672

septic systems

Have a trouble-free septic system 2675

servers

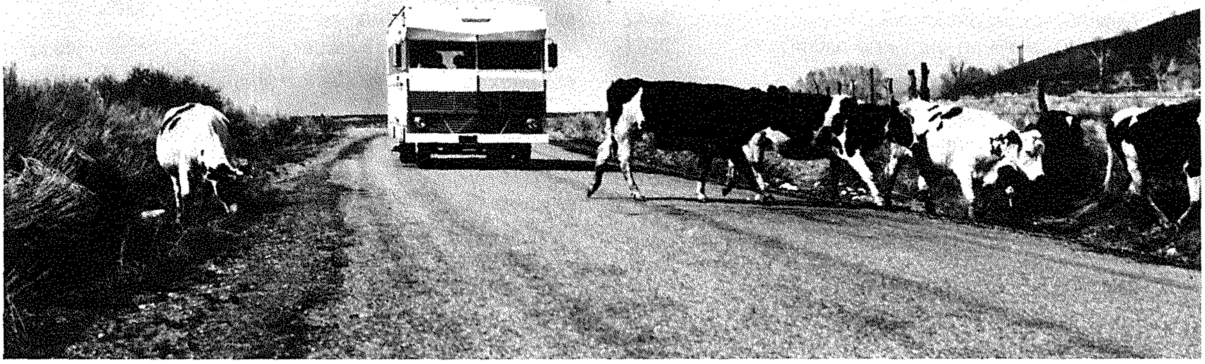
An early American server 2682

How to be a savvy RV pilot

By V. LEE OERTLE

All it takes is one close call or an accident to make you realize that there are some special tricks to driving a recreational vehicle or pulling a trailer. It is important to make sure that everything is securely fastened and you are driving with confidence but defensively

ANTISWAY CONTROLLER should be installed to keep rig from straddling the white line as at left, above. Trailer towers should always stay in the right lane except to pass. Whipping back and forth, and sway, are danger signs.



SUDDEN STOPS can be a part of any vacation, and stopping distance is much longer with a large heavy rig. Brakes and tires must be kept in top shape, all loose gear must be secured and children kept out of aisles.

TIE-DOWNS were forgotten by the driver who borrowed this pickup camper. A fierce gust of wind actually blew the camper right out of the truck cargo box. Remember your camper also requires separate insurance.

THE DAY of my accident I should have noticed the clues ahead of time. Summer heat had leached oil up through the blacktop pavement and patches of it made purple splotches against the ribbon of highway. Then the Utah sky ripped open with rain and the oil began to drift over the crown of the road. The bus ahead of me slowed down yet spray from its jumbo tires opaqued my windshield with an oily film.

Then, with no warning, the back end of my pickup camper skated around and I found myself traveling backward! The driver behind me stabbed his brakes, started to skid, and I knew we were all going off the highway. Later I learned my big flotation tires had hydroplaned up onto the layer of water and oil. My truck slid sideways down the sloping shoulder as I tightened my seat belt. Then the rear wheels struck a rock and we rolled until we came to rest upside down in two feet of ditch water. I opened the belt release, fell onto the cab roof, and forced my door open to wade away unhurt in the knee-deep muck. Through my shock I heard the truck engine running wide open though upside down, and I stumbled back to shut it off as other drivers stopped above to offer help. The cab was badly damaged but the camper body holding up the truck was only dented and not crushed. The accident, however, has made me give a lot of thought to factors affecting RV safety:

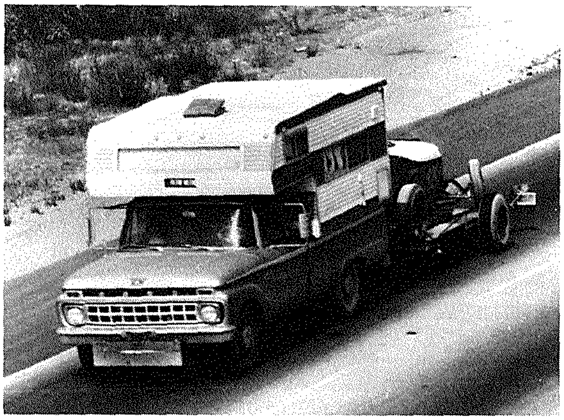
While under way in any kind of recreational vehicle, make a habit of stowing away securely all loose gear in you camper. Heavy tools should be stored in a special bin; not in the cab or passenger compartment. Passengers should remain seated and preferably safety belted.

Pickup camper owners should pay more attention to tie-downs. A strong wind can blow the camper out of the cargo box. Vibration can loosen turnbuckles, so they should be regularly tightened. A camper body that pulls out during an accident may then be struck by a following car.

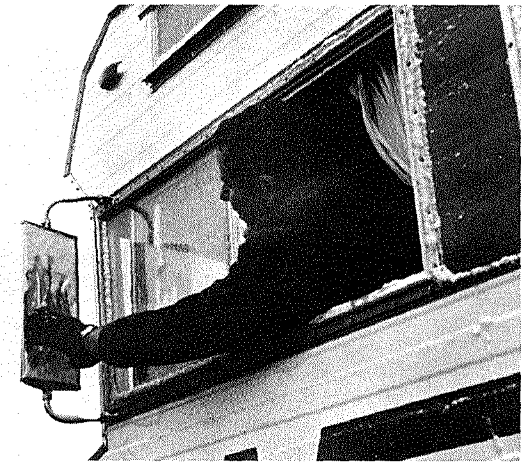
Travel trailer accidents can result when a big trailer towed by too small a car starts to sway. Other causes include too much speed and cheap

SEE ALSO

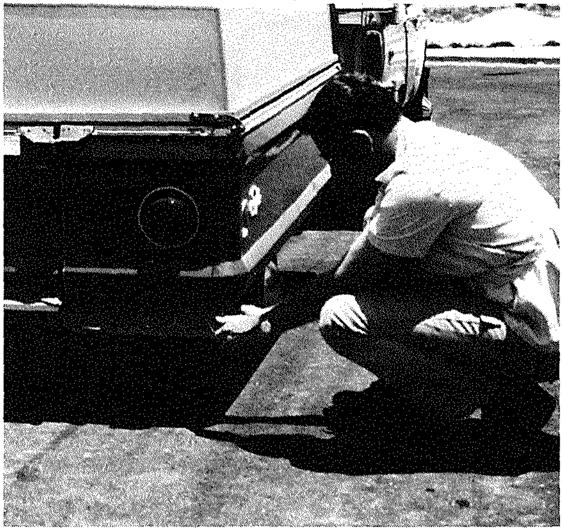
Autos, safety . . . Campers . . . Night driving . . . Trailers . . . Trailers, tent . . . Vacation homes . . . Winter driving



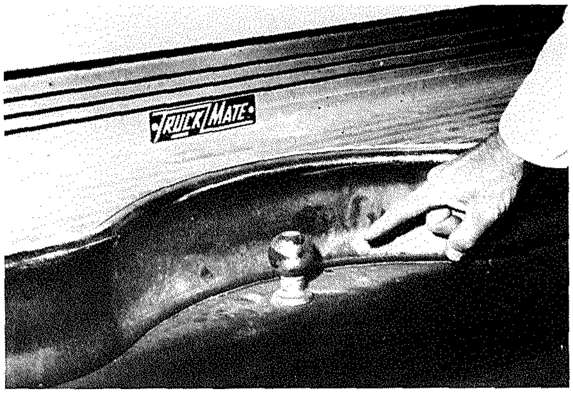
TRAILER CARGO on a flatbed trailer must be secured as well. Without chain binders at all four corners, the racer could plunge forward during an emergency stop, and crash through the camper.



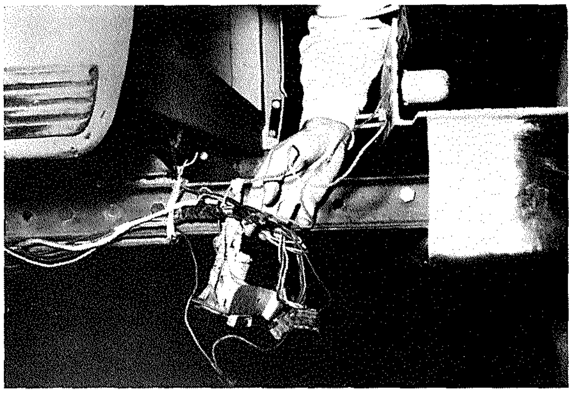
MIRRORS at the left and right are particularly needed by the RV driver as faster cars continually pass him. Use a windshield scraper when mud and snow collect if the mirror is too far out for easy cleaning.



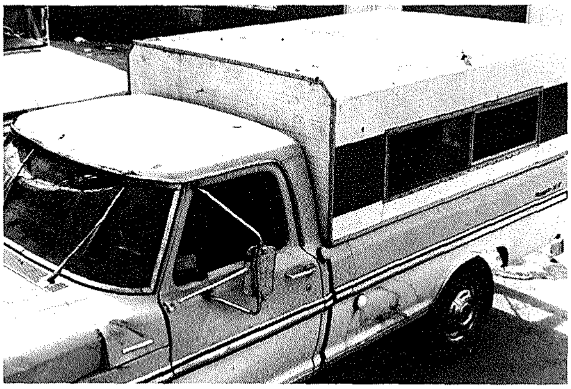
STABILIZER JACKS should be checked regularly. If your tent-trailer jacks are left in a down position by mistake, they could catch in a chuckhole or on railroad tracks and tear the trailer away from the car.



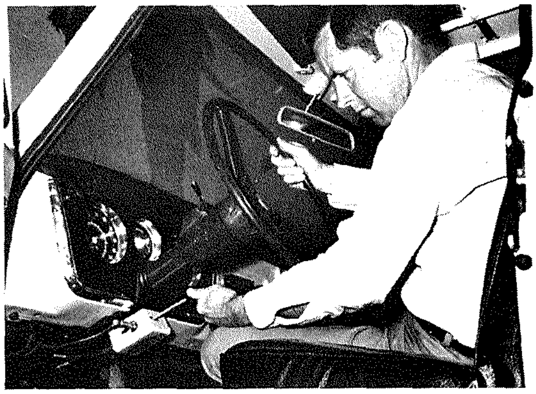
BUMPERS of most cars and trucks will flex too much and are not usually designed to take the many stresses of towing unless they are specially braced as shown here. Stiffeners should run back to the frame rails if you are towing large trailers.



THIS ELECTRICIAN'S nightmare of wires is typical of using too many trailer hookups. This might happen if you use boat, horse and travel trailers interchangeably. In this situation the couplers could drag on the pavement and cause a fire. Keep all connections neat.



ROLLED OVER three times by the author, this camper body shows surprising strength. It is made with foam-sandwich construction. As described in the article, the truck landed upside down but only the cab was badly damaged after skidding off the road on a rainy day.



ELECTRIC BRAKES for the trailer you are towing should be adjusted on a regular schedule before there is any chance of an emergency stop. Set them so that they come on just ahead of the car brakes to prevent any possibility the trailer might jacknife.

THIS PICKUP camper hit a carport roof and crumpled the corner of the cab. Fortunately it did not twist or buckle the frame. The accident revealed the basic strength of this somewhat fragile-looking rig. The window glass didn't even break.

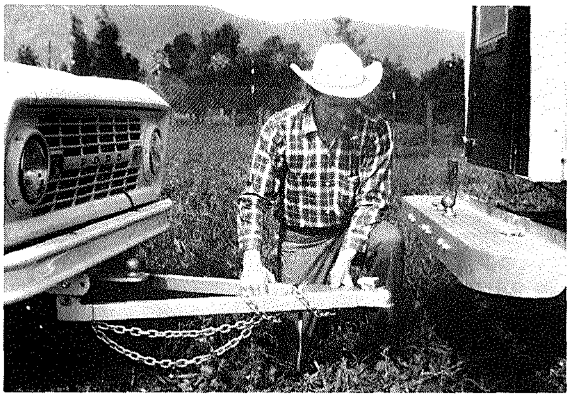
FRONT-BUMPER load, like the trail-bike shown in this photo, can cause a serious accident if it falls in front of RV. For safety's sake, a rear bumper mounting is much better. But be sure the unit is set in a special carrying rack and double-strapped as well.

bumper hitches. Use equalizing hitches and anti-sway bars.

Motor homes should allow extra stopping distance, avoid tailgating and save brakes by using lower gears.

Tires must be the right size and with good tread of the same pattern at each end of an axle. Slow down during heavy rains.

Strap down boats carried on camper tops, bicycles and trail bikes on bumpers.

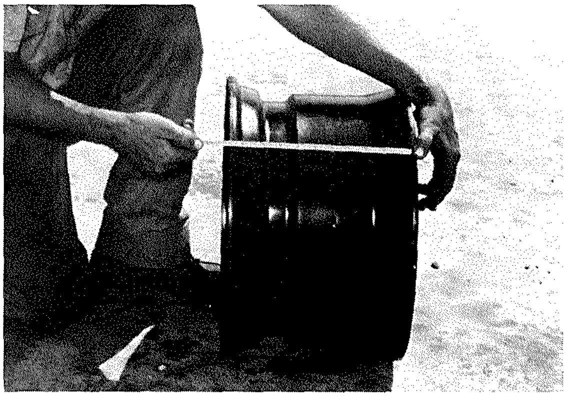


A TOWED VEHICLE should be given special care in hooking up. Use a strong safety chain plus proper brake and light couplers. The hitch should be strong enough so that it can take the strains of a heavy load. The extension bumper shown in this photo had too much flex.

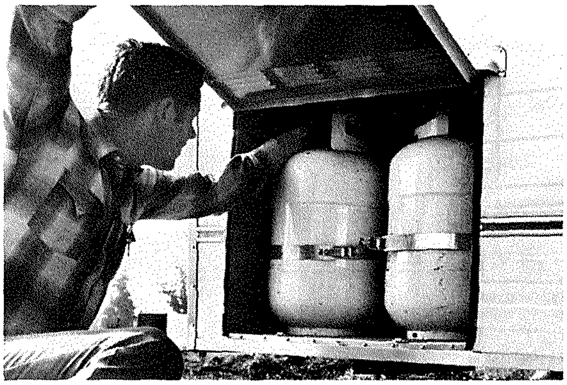
BUILT-IN jack legs must be hinged and strapped securely in place to prevent dropping and dragging the camper off the truck body while it is in motion. Sidewall brackets, floor bolts and turnbuckles can all be combined to hold the camper in the truck box.

REAR LIGHT check is important in daytime as well as at night. It is one of many safety checks you should make before any trip. Be sure to examine your brake stoplights and turn indicators regularly and always carry spare bulbs for them.

Should an accident happen, make sure all passengers are out of the RV, shut off the motor and propane supply, take pictures, record witnesses and light warning flares away from possible fumes.

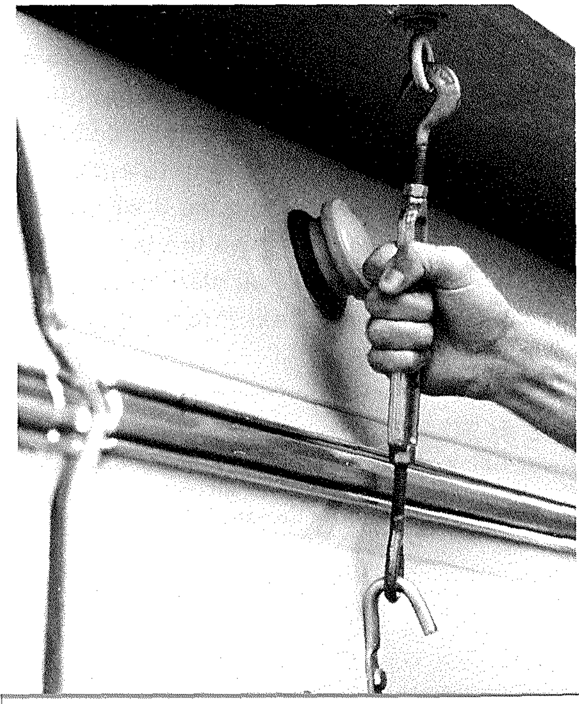


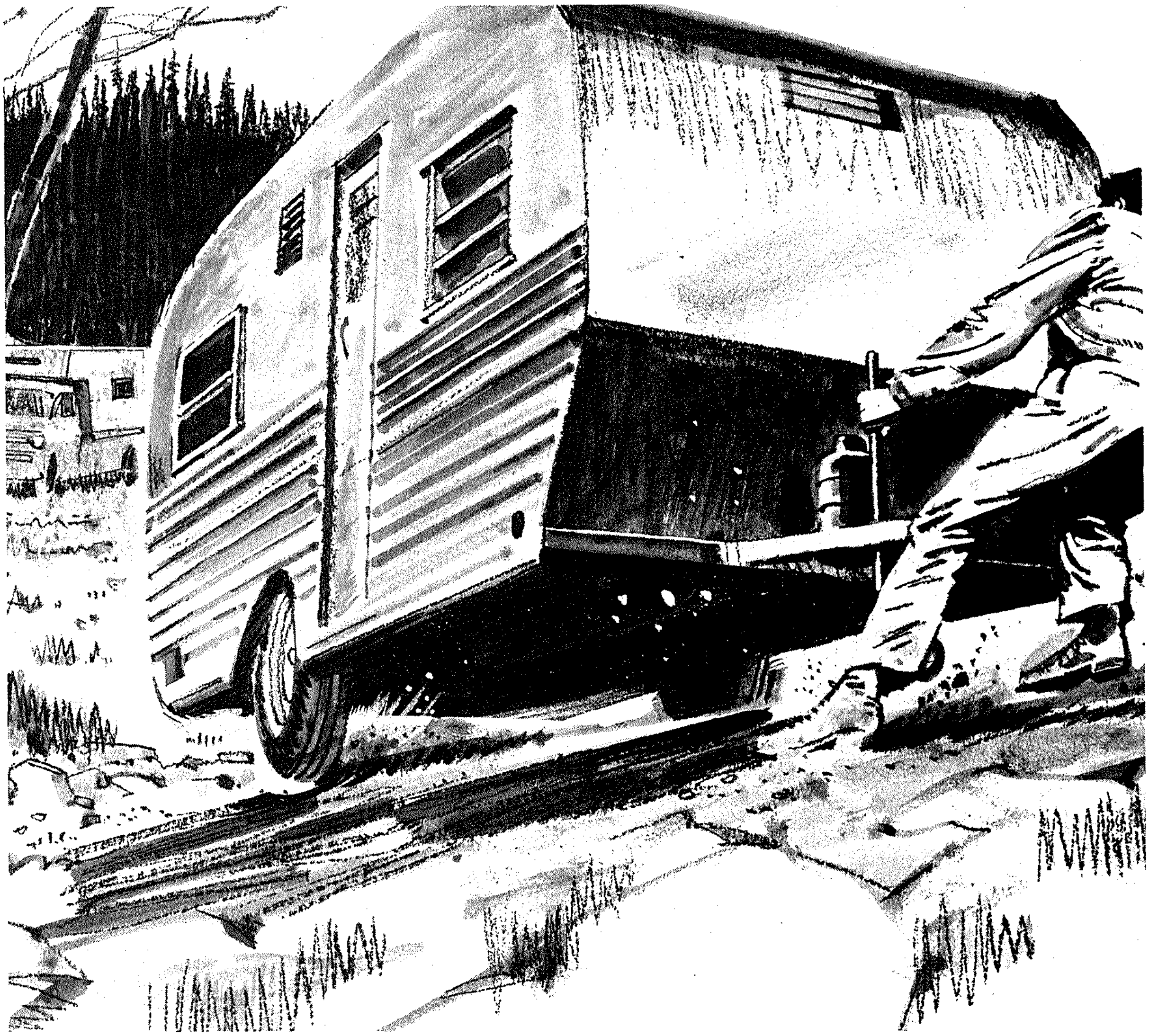
EXTRA-WIDE RIMS must be used when you switch to superwide tires. Without this precaution you are inviting an accident. The rim shown fits 10-16.5 Super-Single that provides the truck with the wheel strength to match the tire weight capacity.



SHUT OFF the propane tanks before starting a trip as a safety precaution. This simple step could help prevent a fire in the event of an accident in which the LP gas lines are ruptured. Prechill your LP refrigerator and start it again at the campground.

TURNBUCKLE hold-downs have a way of vibrating loose, especially on a rough road. Check them at every gas stop. Don't try to tighten them by applying leverage with a long-handled tool as it might break them. Snug turnbuckles tight with your hand.



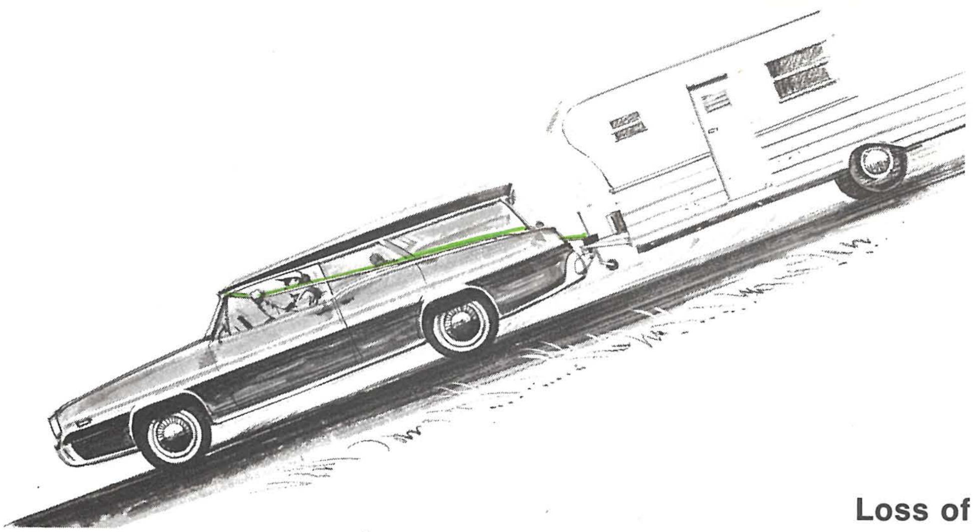


How to handle 12 camping emergencies

The unexpected will happen at some point in your camping career. But it won't be disastrous if you know how to handle it. Take a trailer that runs away just after you disconnect it. What do you do? First, try yanking on the safety cable or handle on the trailer tongue to activate the brakes. If this fails, try to change its direction so it will cross the slope—push a front corner sideways, or grab the jack handle and tug toward you, or throw a rock ahead of one wheel. If all else fails, shout a warning to campers in the trailer's path. The next three pages show you how to handle other camping emergencies

SEE ALSO

Autos, safety . . . Boat camping . . . Campers . . .
Camping . . . Night driving . . . Trailers . . .
Trailers, tent . . . Vacation homes . . . Winter driving



Loss of Car Brakes

■ If your car has automatic transmission, yank down into second gear, then into low. With a stick shift, keep shifting down until vehicle speed is reduced as much as possible through engine compression. Remember these pointers:

If you're towing a trailer with its own brake system, manually move the electric-brake lever to activate the brakes. Apply the brakes firmly, but don't lock them up. A 20-foot travel trailer with its own brake system can stop its own weight plus that of the towing vehicle if the driver handles it gently.

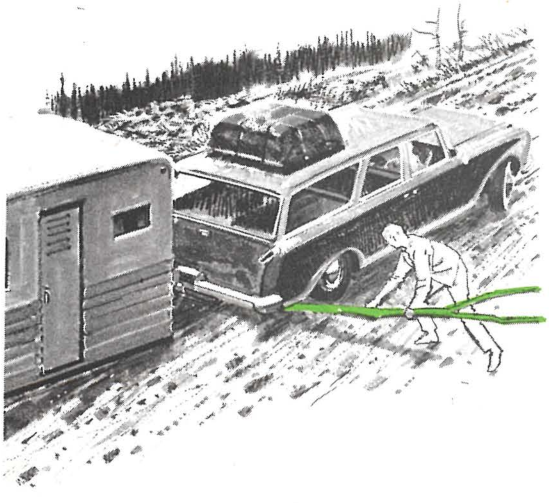
If the trailer has hydraulically actuated "surge brake" controls, the only way to stop it when the car brakes fail is with a long emergency cord reaching from car window to trailer-brake master cylinder. Pull on it!

Brakes Fade

On tortuous downgrades that require frequent braking, the brakes may simply fade away. You'll get the pungent odor of an overheated brake lining, too. What to do?

Just pull off the road and let the brakes cool for at least 20 to 30 minutes. Then remove the hub caps. This will give improved cooling to the hubs.

When you start up again, operate in lower gears only. By using the transmission as a brake, you can prevent overheating of the brake linings.



Vapor Lock

■ The most common problem in hot weather is still old vapor lock. Because of high-temperature operation under the hood, gas simply vaporizes before it reaches the carburetor. Try wrapping a wet rag around the fuel line. Or if you have any fresh fruit handy, cut an orange, grapefruit or melon in half and squash it down over the fuel pump. The fluids in the fruit will cool the pump quickly and usually allow the engine to start again. If the engine is persistently plagued with vapor lock, install an electric fuel pump to end the problem.

Parking Brake Won't Hold

■ Suppose you are towing a trailer up a steep dirt road in a wilderness area—and the engine dies. You quickly set the emergency brake, but it won't hold. The car starts to roll backward. What to do?

While you hold your foot on the brake pedal, have someone throw rocks or dead limbs under one of the car's rear wheels. If there is nothing handy, an emergency technique is to let the car and trailer purposely jackknife—but slowly. That will prevent it sliding any farther. However, it also will block the road on both of the lanes.

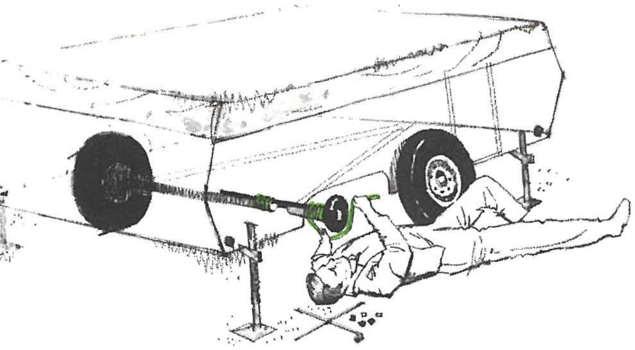
Situations like this illustrate the importance of carrying wheel chocks.

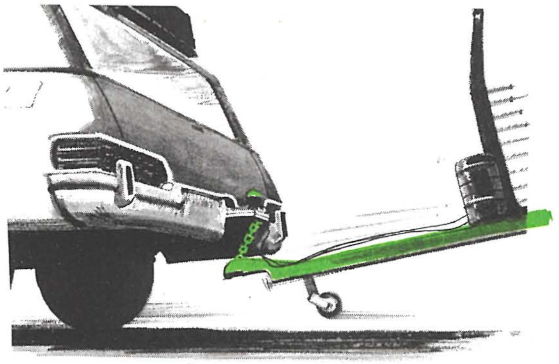
Broken Axle on a Small Trailer

■ This emergency is rare—but I've personally seen it happen more than once. A friend of mine broke the axle on his tent-trailer by towing it too fast over a rocky road. In my case, I backed a boat trailer into a submerged dock-post which had been torched off. What to do when you can't find a suitable replacement for the axle?

I solved my crisis by scrounging up an old water pipe about two inches in diameter. I cut it with a borrowed hacksaw so that it just about reached from end to end on the boat trailer axle. I used heavy wire to lash the section of old pipe to the axle until I was sure it wouldn't work loose. Crude, perhaps, but with that done I was able to drive 47 miles to the nearest town with welding facilities to make a permanent repair (which consisted of welding a heavy, solid bar to the broken axle).

In a spot like that, a broken axle could be repaired with a sturdy steel fence post, or even a stout pole. The idea is just to make a temporary stiffener to get back to civilization where you can look up the nearest welding shop.





Trailer Disconnects at High Speed

■ If a hitch-ball breaks, the driver will feel a slight jerk as the coupler slides or bounces down to the end of the safety chain. This sometimes happens when the trailer is towed at too high a speed over chuckholes, railroad tracks or rocky roads. What to do? Remove your foot from gas pedal and hang onto that steering wheel. When you feel the trailer nudge the back of your car, brake very gently. Keep this up, constantly increasing brake pressure while you steer to the side of the road. Never slam the brakes. The trailer might be at the end of a swing and snap the safety chain. If the trailer breaks completely away, the brake-safety switch should lock the trailer brakes. But only the crown of the highway controls which way the trailer will slide. If you're a good driver you can use your car brakes to help slow down the trailer by letting it ride against your bumper. If you stop too fast the trailer tongue will veer away and you'll lose it; too slow, the trailer may push your car to the left or right.

Blowout at High Speed

■ A blowout is a special hazard. How well *you* handle this emergency determines the outcome. Above all else do not hit the brakes! Remove your foot from the accelerator pedal. Get a good grip on the steering wheel and edge the car over gradually to the side of the road. Let it coast until the speed is down, then begin gently braking the vehicle.

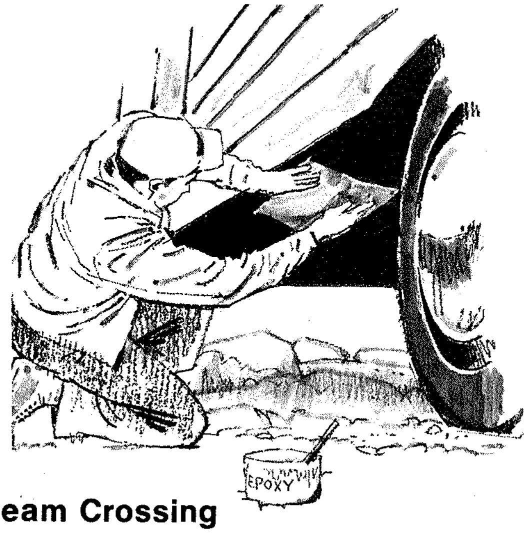
If a blowout should happen to your car while on a very busy stretch of a freeway system, don't try to change the tire there. Drive to the next off-ramp and leave the freeway. Vacationers have been maimed and killed just because they tried to save a $20 tire carcass.

Ripped Holding Tank

▩ A rock puncture in your holding tank can disable the sanitary system, leaving you open for legal liabilities. What to do? First, if it's just a puncture, try sharpening a short stick and driving it into the hole. If it's a slash, it will require a fiberglass patch. Saturate a large patch of glass cloth in catalyzed resin and lay it over the puncture. Tape the cloth to the tank to hold it in place while it dries.

Roof Gash

▩ A roof gash will let in rainwater, which in turn flows down the walls and warps studs, twists paneling and stains just about everything. Cover that gash! A simple fiberglass patch over the damage will hold until you can reach a service shop. (Actually, it should hold indefinitely.) If you don't have fiberglass, cover the hole with fabric, cardboard, plywood, metal scrap or anything else that you can tape or glue into position. A tip: Sometimes it's better to cut off the branch that caused the gash and pull it through the inside of the trailer. If you try to back the vehicle away, you might enlarge the gash.



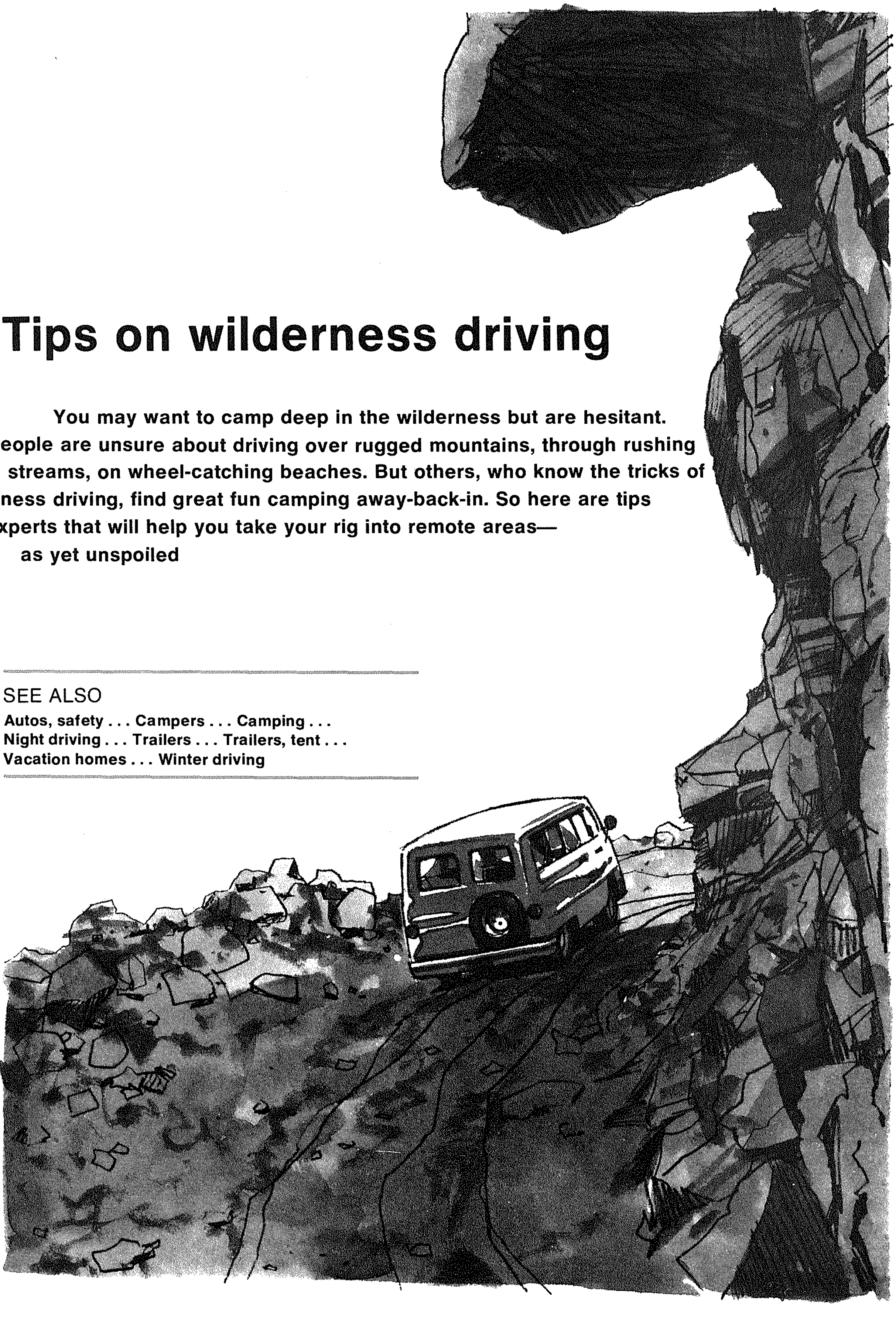
Stream Crossing

▩ Should you attempt to cross? It all depends on the bottom. Park your vehicle. Find a stout stick to test the bottom. Wade out into stream. Be careful not to slip. If the stick clicks down against gravel, rock or hardpan, you can proceed. If the stick disappears in ooze, forget crossing. Take another route out. When towing a trailer, sometimes it's best to drive across the stream without it. Then tow the trailer across with a rope hooked to the vehicle on the other side of the stream.

Sandstorm

▩ The chance of encountering a dust or sandstorm during a summer vacation is always present—particularly in the Southwest. Should you proceed? Opinion differs. Personally, I'd rather drive through such a storm than try to sit it out. The quicker you get out of a sandstorm, the better, and immediately after driving through it, stop at the next service station. Have the oil and oil filter changed, the carburetor air filter replaced and the wheel bearings cleaned and repacked.

REMEMBER—Never travel with coach or trailer windows (or roof vents) open. Dirt and debris will be sucked in.



Tips on wilderness driving

You may want to camp deep in the wilderness but are hesitant. Many people are unsure about driving over rugged mountains, through rushing streams, on wheel-catching beaches. But others, who know the tricks of wilderness driving, find great fun camping away-back-in. So here are tips from experts that will help you take your rig into remote areas—as yet unspoiled

SEE ALSO

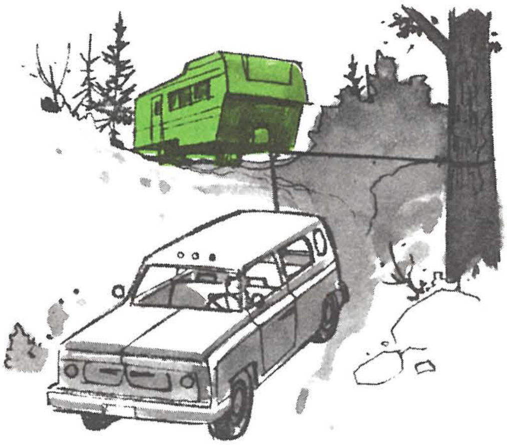
Autos, safety . . . Campers . . . Camping . . . Night driving . . . Trailers . . . Trailers, tent . . . Vacation homes . . . Winter driving

How to get unstuck

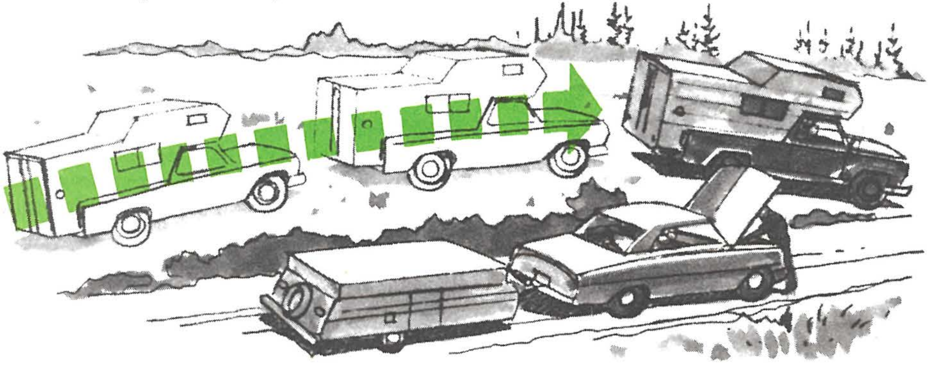
- If your trailer bogs down, disconnect and drive car onto firm ground. With 100-foot, ½-inch nylon tow rope try pulling trailer straight out. If this doesn't work, run rope through a pulley which you have attached to rock or tree. Tie rope to trailer tongue and to car hitch. Pulley will change the direction of your pulling effort. If this fails, back car so it's at a 30° to 40° angle to trailer. Tie rope to near side of trailer. Ease forward. The sharp angle should twist one trailer wheel out of bog. Stop, unhitch, repeat on other side.

If stuck with a pickup truck camper, jack up bogged wheel or wheels. Fill hole with any of the following: small stones; floormat from cab; the spare tire; burlap sacks; twigs; dry needles; long-stemmed dry weeds (green weeds or leaves are slippery). Lower truck and ease out.

Remember: Maintain momentum when driving or towing through sand, streams, mud. Stop in the middle for any reason—you're stuck.

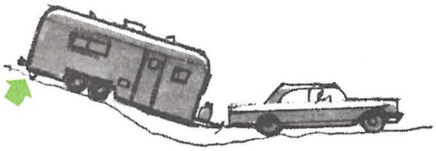


wilderness driving, continued on next page



How to pass a stalled vehicle on a wilderness road

When passing a stalled vehicle on a narrow road always take the route which circles the high side of the road. When passing on the low side, your tires may bog down coming back up onto the road.



Scrape protectors

- As your car enters a short, steep wash or gully, then climbs out, the back of your trailer will drag. To protect undercarriage hardware such as septic holding tanks, it's best to have skid bars welded on before driving in the wilderness. These protective steel bars will take the punishment.

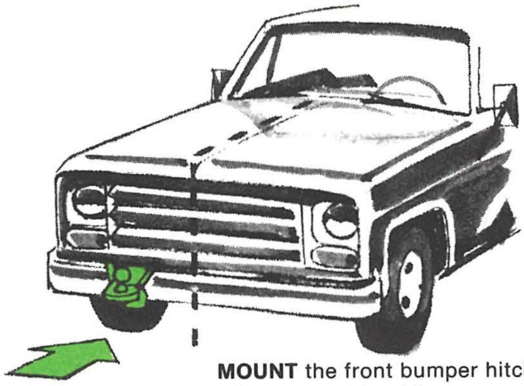
WHEN YOU'RE DRIVING a camper up a steep slope littered with small pebbles, tires may not get good traction. Try to turn the rig around and back up. Station a guide whenever you back. Most damage to vehicles occurs when backing.

LOAD-EQUALIZER hitch spring bars should be removed when towing through sand, mud or up and down steep gullies. This lowers full weight of the trailer tongue onto the car, providing better traction. It also makes the tow-joint flexible.

Attach front bumper hitch

■ A simple bumper hitch mounted on the *front* bumper of the truck or van will let the driver maneuver his boat trailer or other towed vehicle into tight spots for boat launching, or where a one-lane road precludes turning around. Be sure to mount hitch about 6 inches off center toward the passenger side (curb side) so driver has forward vision along one side of trailer.

■ **DON'T PARK** in dry washes or gullies. Though they break the wind, they are prone to flooding. Flash floods can trap you even when it rains in the mountains many miles away. Choose high ground. Also, don't camp under tall, dead trees. Brisk winds at night can break off heavy limbs and send them crashing through your camper. Many campsites have been wiped out by flash floods or damaged by falling trees.



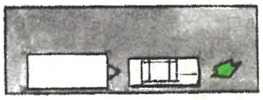
MOUNT the front bumper hitch off-center so the driver can see.

LETTING AIR OUT of tires trapped in sand is still the best escape method. But make sure you let out *plenty*. If the casings have not deflated to a pear-shaped blob they're still too full! Then drive *slowly* out of the sand. Replace the air before traveling long distances or permanent damage to tire cords is likely. *Always* carry a *tire pump*.

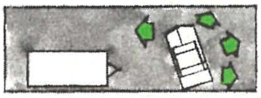
SUPPOSE YOU MEET someone head-on on a narrow dirt road? Common sense dictates that you talk it over which way to the closest turn-out. The law in some state gives the *uphill* driver the right-of-way. The *downhill* drive must back up to a turn-out. (Backing *downhill* is dangerous!)

How to turn around on a narrow road

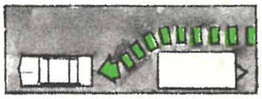
Turning around on a narrow wilderness road is not as difficult as you may think. A careful driver can about-face his trailer in a space as wide as the trailer is long. Here's how.



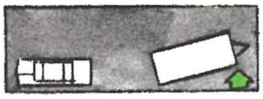
LOCATE widest spot in the road. Now park as far to one side as you can. Watch for soft shoulders. Disconnect trailer.



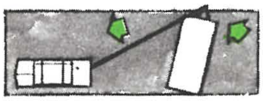
TURN the car around by making short, sharp turns with the steering wheel, jockeying forward and back.



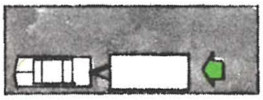
SQUEEZE past the trailer and park about 50 feet beyond.



PUSH the front corner of the trailer by hand, turning it so it angles across the road as shown.



TIE a rope between the trailer tongue and car hitch. Then use the car to pull the trailer completely around.

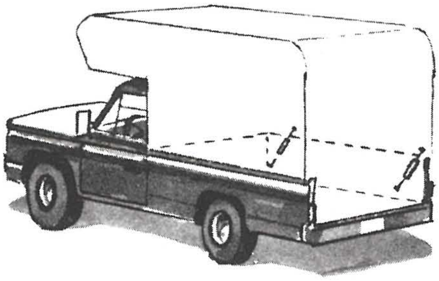


HOOK up. If the trailer is tough to push by hand, use a pulley attached to a nearby tree. Run the rope trailer to pulley to car.

Know your top clearance in brush country

■ Measure the height of your rig before leaving home. Carry a 10-foot folding rule in your glove compartment. It's easier to measure a low limb from the ground than to climb onto the coach roof to judge clearance nose-to-nose. When driving under trees keep a sharp eye on thick clusters of leaves low enough to dust the roof. Leaves may conceal broken limbs that ram tops.

Tighten camper bolts



■ If the road is unusually long and rough (like the Alcan Highway) tighten floor bolts daily, or oftener if they keep loosening. If you use turnbuckles, give them a light twist twice a day. Use your hands. Twisting with a screwdriver may only crack, break or weaken them.

Don't bury emergency equipment

■ Leave jacks, ax, spade, tire chains, wheel chocks, tow cable, saw, rope where they can be easily reached without major unloading. On long trips into remote areas, carry two spare tires—and a tire repair kit. Don't forget a tire pump, either. Carry extra gas unless you're sure a full tank will get you there *and back.*

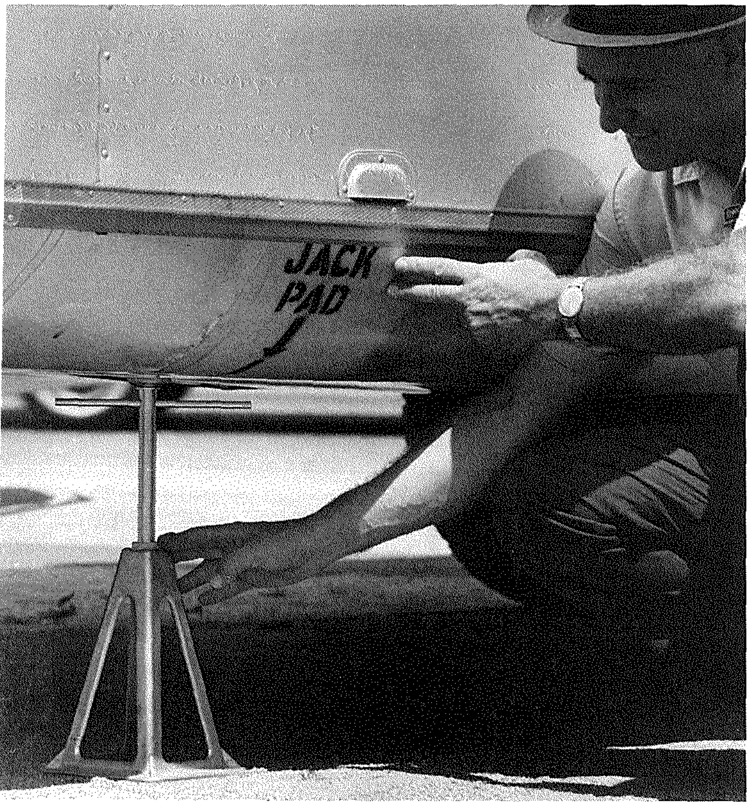
Check for breakage

■ Stop every few hours and check interior for overturned boxes, spilled drinks, open cabinets. Use heavy rubber bands to secure cabinet doors. Stretch bands between cabinet knobs. Keep windows closed tightly to keep out road dust.

REMEMBER—the best of all advice is to travel in pairs. Having another vehicle along assures drivers that help is always handy. There isn't much excuse for both vehicles getting into trouble.

How to winterize your camper

By V. LEE OERTLE



ON MANY travel trailers utilizing a full underbelly, the only place stabilizer jacks should be set is under the words "Jack Pad," stenciled on the coach. These words indicate the location of the frame channels.

▪ IN ONE WINTER your recreation vehicle can be ruined if you're not careful. That's right—improper winter storage can give your RV a down-at-the-heels look before spring.

The first important decision you must make is where to store your rig. This can make all the difference.

Above all, don't park it under a tree. Falling limbs can puncture the roof. Bird droppings can stain the exterior. Tree sap can be the devil to remove.

SEE ALSO

Autos, winterizing . . . Campers . . . Camping . . . Trailers . . . Trailers, tent

Avoid locations with heavy pedestrian or vehicle traffic, such as gateways, pathways, busy parking lots. The less the traffic, the less the damage to your RV. Also, watch out for spots where gates can swing open and strike the coach. In a storm, a wildly-swinging gate can severely damage the aluminum skin. It's easily punctured but hard to repair.

The best parking-storage locations are in wind-protected spots, or under a carport or roof of some kind. Many owners prefer to cover their coaches with a tarpaulin. Aluminum does not rust but eventually it begins to pit and corrode. Once the finish is dulled by weather, it takes a cleaning with acid to bring back the gloss.

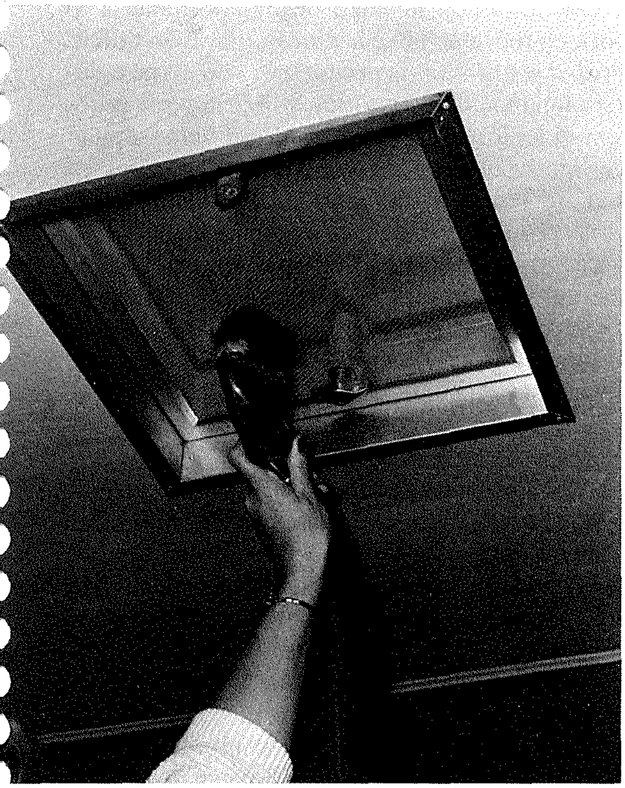
stabilizing the vehicle

Next, stabilize your RV properly. If the coach can be parked on a paved surface, that's best. Otherwise, set wood blocks underneath the stabilizer jacks. All four corners of the coach should be stabilized so that wind-action won't rock it about. *Caution!* Some travel trailers have locations plainly labeled jack pads. Use stabilizer jacks *only* at those points. On any trailer, place stabilizer jacks under main frame members. *Never* place jacks under outboard struts or wooden channels.

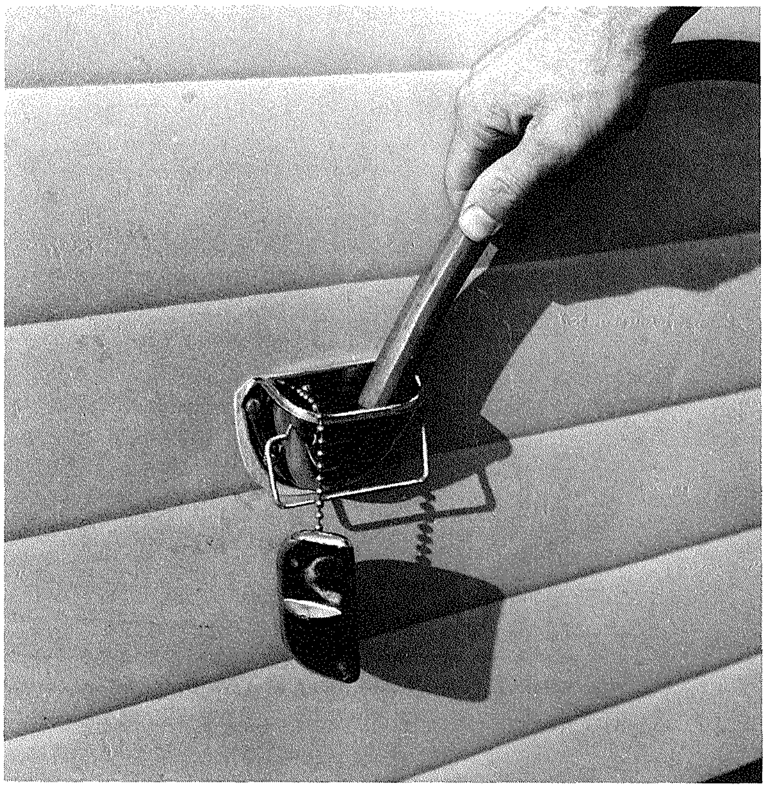
Now, pay attention to your tires. Much misinformation surrounds the proper storage of tires. Latest research indicates that wherever industrial air pollution (smog) is a problem, tires should be elevated off the ground and deflated to 10 p.s.i. *Reason:* Deflating tires allows outer pores to close up. Inflating tires stretches the rubber and makes it more susceptible to damage. But remember, don't deflate tires that are carrying a heavy load. The best protection is to block up the axles with wood or concrete piers, deflate tires to 10 p.s.i., and cover tires with plywood or metal panels as protection against sunlight. This last step is extremely important in desert and Gulf Coast states, less critical in northern regions. Strong sunlight deteriorates tires rapidly.

Surest protection for tires during the winter is indoor storage. If you don't plan to use your vehicle during the winter months, jack up the chassis and remove the tires, deflate them and store them in a shaded, well-ventilated area.

With the RV anchored, you can tackle the interior. Coach interiors collect stale odors during idle storage. Causes can be traced to such things as leftover fish bait, a forgotten cheese



VACUUM ALL interior screens before storage. Dust on screens collects moisture which encourages rust. Also vacuum the cabinets, closets and drawers.



DRAIN, FLUSH and cleanse water tank so that all stale water tastes are removed. Keep the tank lid tightly closed during storage to keep out dust.

sandwich in a hunting jacket, or a spilled puddle of gasoline under a leaking portable generator. Look throughout the coach for leftover foods and beverages, opening all drawers, cabinets, storage bins, closets, and appliances. Something innocent as a cabbage leaf is potent when trapped in the airtight interior. With meticulous care remove soiled handkerchiefs, hunting boots and all dirty clothing. This will eliminate the source of many stale or sour odors.

Get those stains, too. Don't leave that streak of tomato juice on the dinette seat. Remove that tar stain from the floor tiles by the front door. Food stains on the table, cushions or bedding will be three times harder to remove after winter storage.

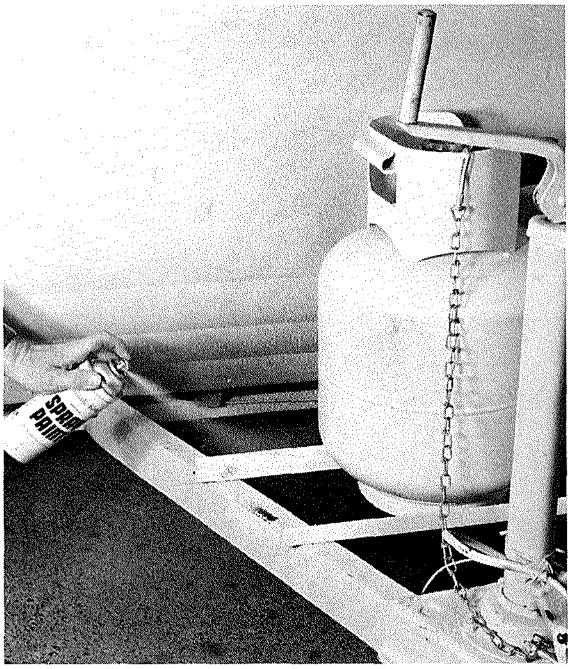
Remember not to leave metal objects in the sink or lying on the drainboard; even stainless steel can leave trace stains due to condensation of moisture inside a tightly closed coach. Vacuum all screens and the interior of all cabinets, closets and bins. Clean and wax the floor and all appliances. When you're sure that the interior is clean and fresh-smelling, then—and only then—start buttoning it up.

Now, shut off the LP-gas supply *at the tank*. On a trailer, that will be on the front frame. Twist the shutoff handle *clockwise* until it has seated firmly.

Enter the coach and be sure all appliance controls are set to the off position. Remove range burners and vacuum dust from the orifices. Replace burners and close the range cover to block dust. If the range lacks a cover, wrap burners in aluminum foil to prevent rusting.

Next, work on the plumbing. Because it can freeze, the plumbing system is particularly vulnerable. To prevent ice damage or bad taste next spring, follow these instructions:

1. Drain the water heater.
2. Drain the water tank and flush it for at least 20 minutes with clean water. Close the drain valve. Add half a box of baking soda and five gallons of water and let it stand overnight. Then drain the tank and flush it one last time. This action neutralizes unpleasant odors or bad taste.
3. Drain the sanitary holding tank, preferably at a service station outlet. Flush it thoroughly. Tighten the valve, and add a small amount of deodorant chemical to the tank. Where neces-



SIMPLE TOUCH-UP with spray paint over rust spots on the frame will prevent worse damage during storage.

sary, use air pressure to rid the sink trap, shower trap and internal plumbing lines of water. If overlooked, as frequently happens, these areas may freeze and break. Flush the toilet several times to rid lines of water.

4. Use a cup and sponge to drain the last bit out of the toilet commode. One coach manufacturer reports this item tops the list of frost-damaged hardware.

5. Place a cupful of antifreeze in each of the drain traps: shower, sink, tub, toilet and commode.

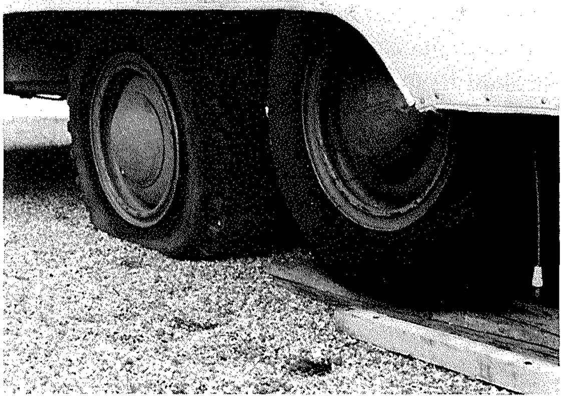
Just to make *sure* that all the water is out of the lines, raise the lift jack on the front of the trailer all the way, then lower it all the way down. This tilts the frame enough to drain stubborn pockets of water. On truck mounts and motor homes, you can accomplish the same thing by parking on a severe angle for a few minutes with all drains open.

Place aluminum foil between glass and screens to keep the sun from fading interior fabrics on cushions, gaucho beds and mattress covers. It's best to remove all bedding and blankets from the coach and store them in your home. But if you must leave bedding in the coach, cover it with plastic *loosely* laid over the fabric. This precaution will prevent wet spots and mildew stains in the event of a leak or draft which may let rain enter the coach.

One common mistake beginners make is to cork up the coach like a wine bottle. Don't do it! Proper *ventilation* is necessary even in the coldest climates. Condensation will become a problem in a closed, cold coach. Roof vents should be tightly closed, but one window or sidevent can be left open about one-half inch on the wind-protected side of the coach. Take the extra precaution of taping a plastic cover underneath the vent window inside the coach. In a severe climate where prolonged subfreezing temperatures are the rule it may be necessary to close vents and windows securely. In this case, the coach should be opened every time a brief sunny period comes along.

Now, observe the following tips for specific types of recreational vehicles:

- *Travel trailers*. Spray a light oil onto the spring leaves. Lube zerc fittings on spring-shackles. Pull a plastic bag over the front coupler handle and tie it down (keeps coupler from rusting). Clean and repack wheel bearings on the chassis.
- *Pickup camper coaches*. If the coach will not be used during winter months, remove it from the truck with loader jacks. (You can rent loader jacks from many equipment yards or local coach dealers.) Loosen hold-down bolts or turnbuckles. Set coach down on wood blocks, *never* directly on ground. While the coach is off the truck, inspect its exposed underbelly for signs of splitting or swelling. Coat exposed areas with heavy mastic or weather-sealing paint recommended by local coach dealers. (Some sealers become sticky in hot weather.)
- *Motor homes*. All self-propelled recreational



SEVERE FLAT-SPOTTING and rusted hub caps may result when you leave tires on trailer during the winter.

Winterizing Special Gear

Some recreational vehicles are equipped with air compressor-type water-pressure systems. Turn the air compressor switch to OFF. Disconnect inlet and outlet hoses from pump and *rotate the pump manually* to expel water trapped inside.

Remove the 12-volt storage battery from the coach. Get it recharged to peak strength, then replace it. Do *not* reconnect battery cables to terminals. Spray a little anticorrosion coating onto the terminals and cable-heads. In extremely cold climates store the storage battery where it cannot freeze.

Don't forget the *water purifier!* They're popular these days. Remove the cover plate and make sure all water is out of it. (In the spring, replace the inexpensive filter cartridge with a new unit.)

Load-equalizer hitches should be removed and stored inside the storage bin or in your garage. The spring bars should get a light coat of spray paint. Bearing-ends of hitchspring bars should be lightly coated with bearing-grease and wrapped in foil.

Clamp-on side-view mirrors on the towing vehicle can be removed and stored for the winter.

If you have a portable electric power generator, it should be winterized. Drain the fuel tank. Drain and change the oil. Clean and replace the air-filter. If the unit is bolted inside the coach, just keep it covered. Otherwise, remove the generator and store it inside your garage. Set it on wood blocks, not on the bare floor. Wrap the generator with a plastic bag but do it loosely to provide for ventilation.

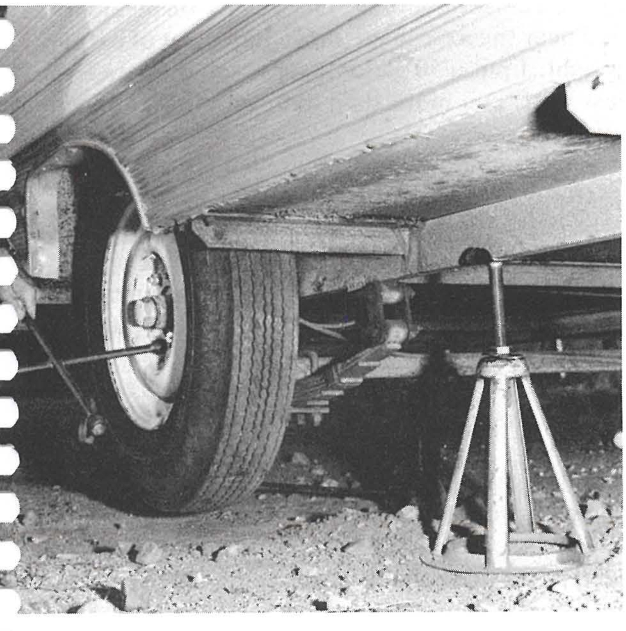
vehicles should be given a complete chassis-lube before storage. Engine maintenance should include oil change, oil-filter change, air-filter cleaning or replacing, and so on. Any service performed on your family car should also be performed on the motor home or van camper. Follow the same advice on tires: block up, deflate. If vehicle might be used occasionally during the winter, do *not* deflate tires, but rotate them at least once or twice each month to avoid flat-spotting.

- *Tent-trailers*. Clean fabric tops thoroughly *before storage*. Do not fold down a wet top. Dry it out first. Remove stains from fabric sidewalls or tops immediately. Keep the unit locked.

Despite all these precautions it's a mistake to ignore the recreational vehicle during the winter. At least once a week, walk around it and make a quick visual inspection. After every storm, enter the coach and look for signs of leakage or puncture-damage to roof. Don't let anyone lean objects such as bicycles, chairs or garden tools against the coach during the winter. In time, such treatment will dimple or dent the aluminum.

Using these winter-storage tips will save you time, money and trouble when you hit the road in the spring.

DEFLATE THE tires and store them indoors. Locate the jack under the frame rail, not an outboard strut.



REMOVE GENERATOR and service gas engine to avoid leaks which may cause unpleasant odors and stains.

With the price of recreational vehicles on the rise, you may not want to trade in or buy a new RV. If not, here's how to update the one you have

By V. LEE OERTLE

ADD BUILT-IN JACKS to your camper; then you can unload the coach anywhere.

Smart ways to improve your recreational vehicle

LET'S SUPPOSE you have had your camper, trailer, van or motor home a couple of years and it's still in great shape. Maybe you don't want to trade, but you've got the itch to do something to improve it. Perhaps you have already purchased about every available option, including a portable generator and an airconditioner. What then?

Cheer up! Here are 15 ways to spruce up any recreational vehicle to increase convenience, extend its free range, sharpen performance, and in general make it a better traveling vacation home.

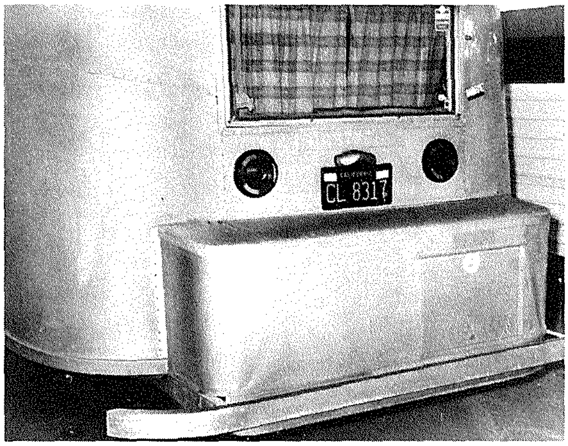
- *Bigger tires.* The first step should be to examine the rubber. Check the tire size and rating. Have your RV dealer tell you what is the widest tire your particular model can handle. For example, hundreds of thousands of pickups are still being sold with 7.50x16 tires, or with the smallest flotation units in size 8.00x16.5. Take a giant step toward improved stability by switching to the 9.50x16.5 or 10x16.5 supersingle, duplex-type tires. You'll need new wheels, of course, to go with them. Make sure you buy brand-name drop-center wheels for supersingle tires. Cheap imitations on the market sell for as low as *one-third* the price of specially-made flotation tire wheels. Cheap wheels negate the value of big tires; they're dangerous.

Many motor home owners can use the larger 12x16.5 tires. Wide tires increase traction, improve flotation and make a great difference in highway stability.

- *More water.* Most standard water tanks range from 15 to 20 gallons, occasionally to 30 gallons. An average family uses 5 to 8 gallons of water daily while vacationing, including water for drinking, cooking, bathing and sanitary flushing. Figure it out. At 5 gallons per day, a 20-gallon tank would last just four days. (If you think I'm overestimating, run your own survey.) Increase your range away from water supplies the easy way. Install an *extra* water tank under a bed, or inside a closet or storage bin. Place it on the floor and near the axle to minimize the effect of extra weight. I put a 50-gallon tank in my own trailer last year, and more than doubled my free time afield.
- *Larger holding tank.* Your sanitary system is pretty well locked into the limits of the holding tank capacity. Fifty gallons of water cannot be held in a 22-gallon holding tank. Since space under the coach frame is limited, replacement of the existing tank is best. Holding tanks up to 50 gallons in size are available.
- *Another butane-propane bottle.* Though many persons refer to LP-gas containers as "tanks," the trade calls them *bottles*. One 5-gallon gas bottle will hold enough fuel to fire a three-burner range and a gas lamp for about five to six weeks of three-meals-a-day usage. But when the same 5-gallon bottle is used to fire a gas refrigerator, space heater and water heater con-

SEE ALSO

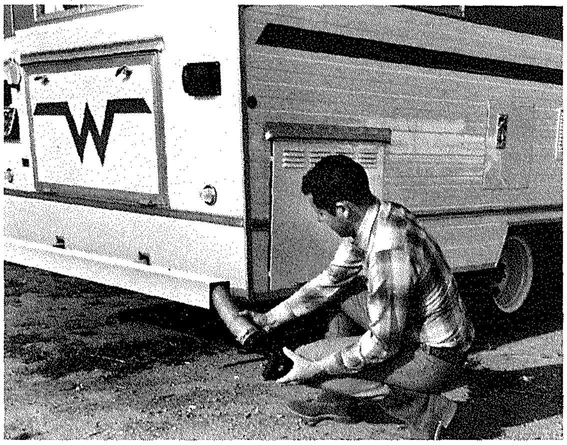
Campers . . . Camping . . . Trailers . . . Trailers, tent



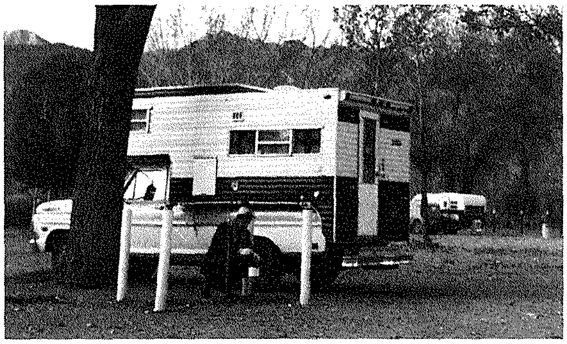
EXTEND YOUR REAR BUMPER and add a trunk that will provide you with space for lots of spare gear.

sumption will zoom to five or six *days* per 5-gallon bottle. What a difference! There are a couple of practical alternatives. You can replace the existing 5-gallon bottle with a 7-gallon size. (Most storage bins have a little extra bottle size.) Or add an *extra* 5-gallon or 7-gallon gas bottle and double your fuel range afield. It's comforting to know your fuel capacity can outlast a five-day snowstorm.

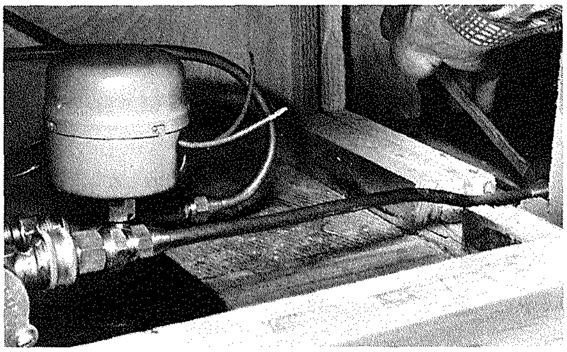
- *Better heating.* Thousands of standard coaches without space heaters have been sold. Suffer no longer. You can get a small space heater that fits into unused closet or floor space, is modestly priced and very efficient. You can even get one for your tent trailer. My Apache Mesa had one, complete with a vent-plate sewn into the fabric wall.
- *Instant water heater.* Did you know you can obtain a flash heater for your coach water system? For somewhere around a hundred bucks, you can find one that lets you wash in warm water, or run a cupful for coffee or tea just by turning a tap. It's instantly ready. This compact unit hangs on the wall like a decorator item. If you're an inveterate hot-drink camper, here's how to eliminate midnight pumping, firing up the range, or running a hot-water heater all night just to have a little hot water on cold mornings.
- *Added storage space.* If your coach seemed a bit overstuffed on your last vacation, you need more storage space. You can cut through *the outside wall* into a closet or under the bed area with a sabre saw. Ready-made bin-doors complete with piano hinge are available at ridiculously low prices. See your coach repair shop or local trailer dealer. An outside-access storage bin is extremely handy for muddy boots, wet clothing, fishing creels, upland game and other items that would be unpleasant inside the coach.



BUY A HOLLOW BUMPER for your motor home or trailer in which to store easy-to-reach sewer hoses.

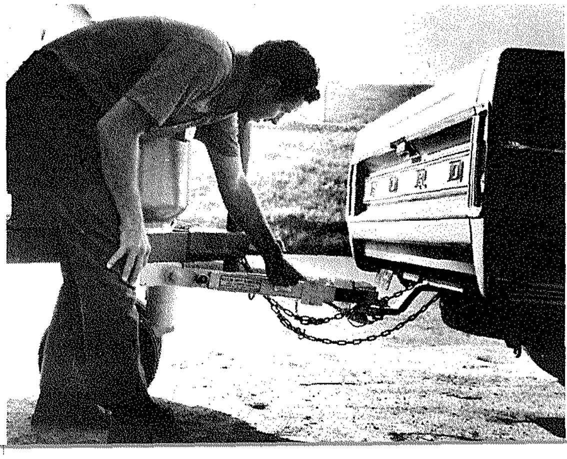


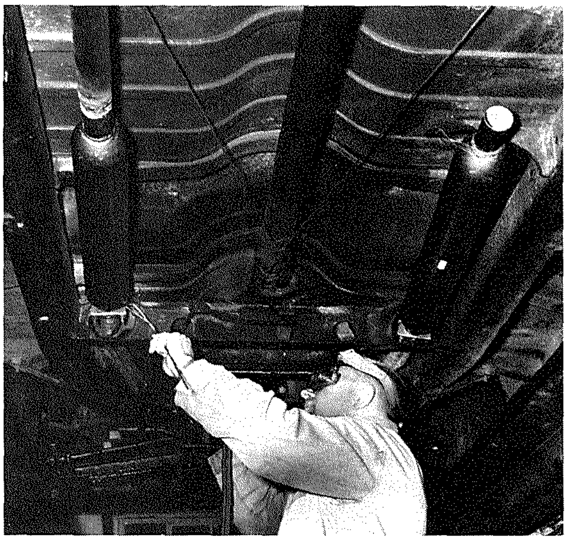
INSULATE WATER LINES and holding tank with foam or fiberglass to avoid freezing during winter camping.



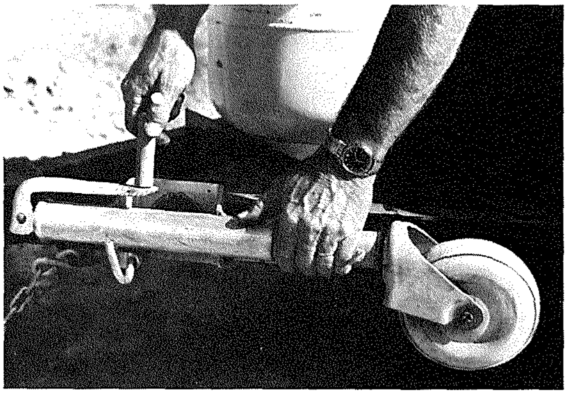
REPLACE THE MANUAL water pump in an older coach with a modern 12-volt electric pump in a few hours.

INSTALL A NEW sway-control device; load-equalizer hitch or trailer dolly alone can't eliminate sway.



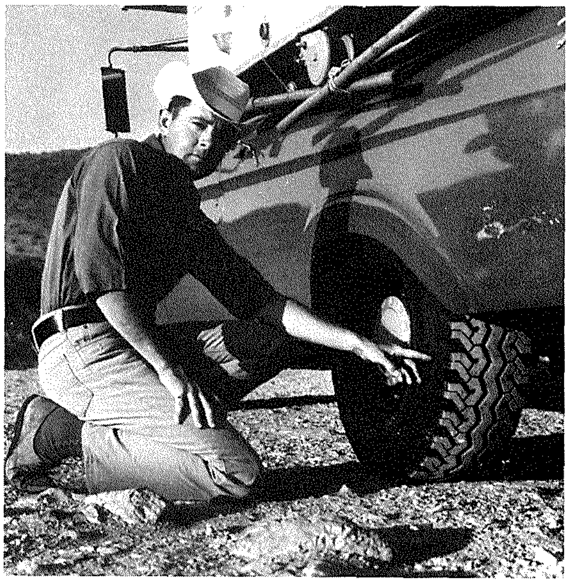


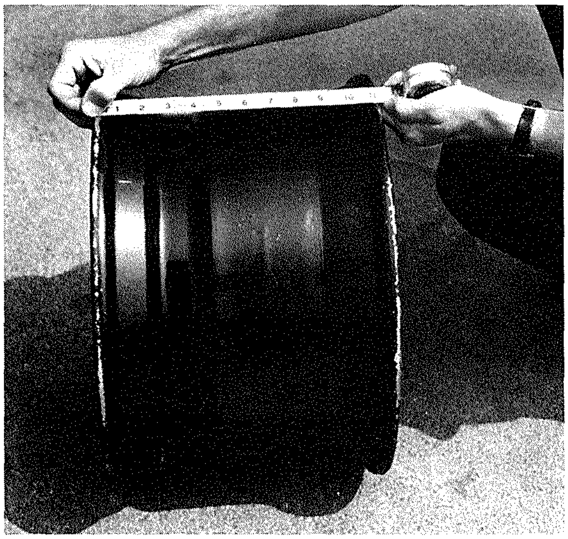
SWITCH the exhaust pipe from single to a twin system to increase performance and reduce the heat load.



A FOLDING TRAILER DOLLY tilts out of the way for travel but provides good support at the site.

SUPERWIDE TIRES double the foot print and provide improved stability, flotation and more traction.



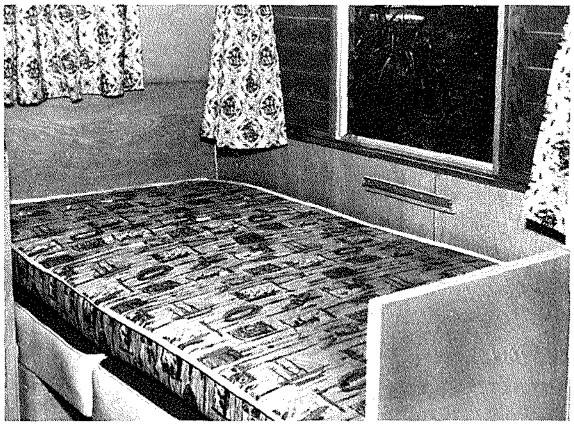


BE SURE wheels can take big tires before you switch to them. The wheel shown is for a 12 x 16.5 tire.

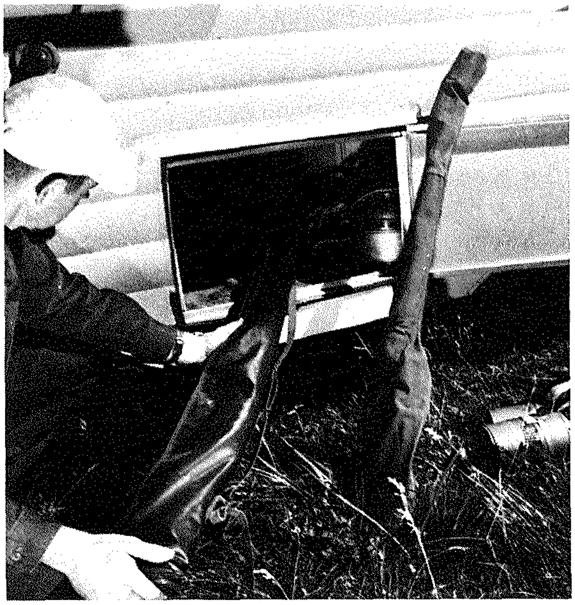
Even in the limited enclosure of a camper coach, you can box-in those wall-to-ceiling corners and add extra wall shelves very easily. Do the same in the cab-over bed section. Wherever you find unused wall space, add a shelf. On motor homes and trailers you can add a backwall trunk. Simply build a wood or metal framework, attach it to the rear wall and cover it with matching metal. A friend of mine built a lightweight metal frame, attached it to the back trailer wall and covered it with prepainted aluminum in one day. The next morning, he sealed the edges and installed a ready-made bin door picked up from a local trailer supply.

- *Built-in camper jacks.* If you own a pickup camper, you'll increase the convenience of your equipment if you install a set of built-in loading jacks. With them, you can remove the coach from the camper, save considerable fuel, and free the truck for other duty. Sometimes it's desirable to unload the coach at a campground to free the pickup for hunting and fishing side trips.
- *Eliminate swaying.* A load-equalizer doesn't automatically stop fishtailing. An equalizer hitch is designed to distribute heavy tongue loads to car and trailer areas better able to handle it. To eliminate swaying you need a sway-control device. This consists of a sliding arm restrained by friction-pads. Tension on the pads is adjustable to provide a dampening action at the exact level you need. For light loads, all you need is light tension to prevent feedback and whipping. There is also a sway control that operates hydraulically. Test a sway-control device with your load-equalizer to learn the difference.

- *Check trailer attitude.* Hitch up your trailer with a normal vacation load and full water tank, and park it on a level pad. Step back 50 feet and drop down on one knee. Study the trailer. Are the trailer and car frames riding level-horizontal? A trailer tongue high or low in front will not tow smoothly. It'll whip and sway easily, bottom over chuckholes and drag its tail in the street. If tongue is high, reduce tension on hitch spring bars. If it's low, increase tension. It may be necessary to move the hitch-head up or down, or to increase or reduce length of the hitch-ball shank to attain that level ride.
- *Pressurize the water system.* Does your older model have a hand-pumped water supply? Install a modestly-priced 12-volt water pump. Then your coach water system will operate at the turn of a faucet. Battery drain is low, convenience of the tap-ready water supply is great. Among other kinds of pressure systems are compact air compressors. I prefer the simple 12-volt pump—you needn't worry whether your old water lines and tank are air-tight.
- *Replace thin mattresses!* In the early days of coach-building, many 2-inch mattresses were provided for standard models. Even today, you'll find a few in over-head bunks, though most are 4 inches thick. Most any RV dealer can obtain a 5 or 6-inch mattress on order. Thicker mattresses provide both extra warmth and comfort.
- *Add an overhead bunk*—maybe two of them, to handle the extra guests your kids chronically invite along. Simple hangerbrackets screw to the wall for pipe-support hammocks. Or install sliding-type bunks which pull out for sleeping, push back to the wall to eliminate overhead restrictions.
- *Get heavy-duty shocks.* Years of road-testing recreational vehicles convinced me that standard shock absorbers on a motor home, pickup, or sedan rarely are any good after 10,000 miles. On some models, shocks succumbed at 5000 miles. In any case, heavy-duty shock absorbers will greatly improve performance, stability and tracking ability. They prevent wheel-hop; help keep your vehicle in a straight line. They minimize tire wear, too, and keep them in balance longer. On some test models, the difference in general stability after switching to heavy-duty shocks was positively amazing.
- *Replace chemical toilet* with a new recirculating model with greater capacity *without* adding a holding tank. A space about 2 by 2 feet is enough for the recirculating toilet.

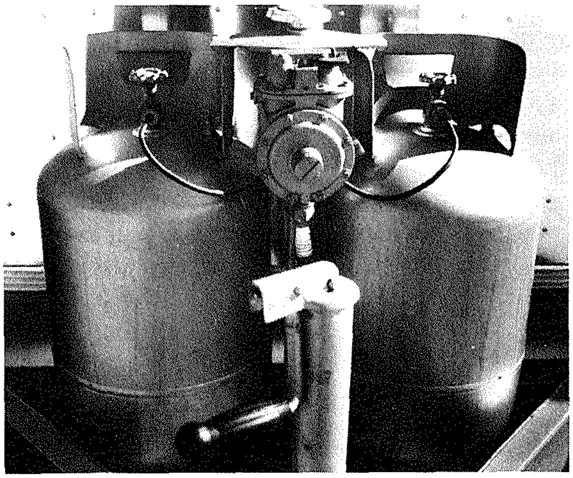


REPLACE the thin mattresses that came with your RV with 5 or 6-inch foam slabs and cover them yourself.



SABRE-SAW an opening, add flanges and a bin door from a trailer supply to make a storage box.

DOUBLE YOUR LP-GAS SUPPLY by adding a second gas bottle and installing a switch-over valve connection.



Checkups that keep your rig rolling

Here are some season-stretching maintenance tricks that will add mileage and more fun for your recreational-vehicle dollars. Check out your rig before it's too late

By DON EDGAR

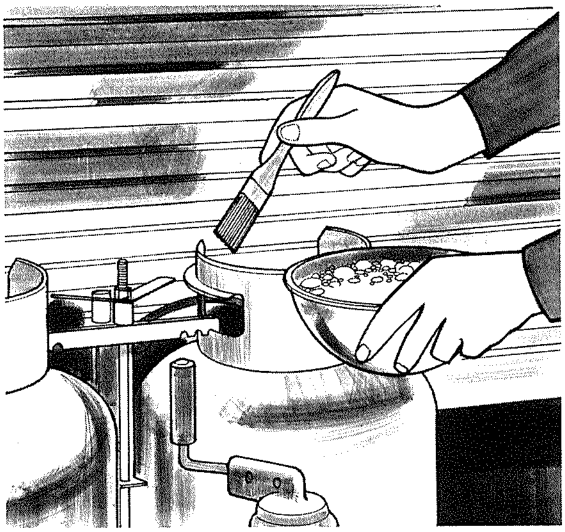
RV OWNERS are learning their rigs offer more than double the fun for the fuel consumed when they're serviced to keep rolling all year. Many motorized vehicles can be kept in commission to serve part-time as the family car and full-time for all-season camping as well. Trailers, too, provide both rolling and stationary utility with just a little routine attention.

Spring and fall checkups should be comprehensive. Add to these a quick daily inspection while traveling to spot any potential problems before they happen. It's worthwhile to work up your own checklists so that nothing is overlooked during the major exams. Then get in the habit of a walk-around routine each day before you start out. You will be surprised at problems that weren't there the day before.

Spring checkup is probably the most important one if your trailer, camper or motor home doesn't receive as much use during the winter as the other seasons. Tires, wheels and axle are a good starting point. Review the load limitations, and remember gross weight is the total poundage of the RV loaded for a trip and not the weight shown on the vehicle registration form. Axle, wheels and tires have maximum load-carrying ability that must not be exceeded. Tire pressures should be sufficient to handle the loaded weight of a trailer; for example, divided by two tires, or four with a tandem axle unit. Maximum rating and pressure is shown on the tire sidewall in pounds or the Department of Transportation code letters. Inspect tires for sidewall cracks, tread separating from the casing, or cupping that might mean a hitch out of alignment. Look at the inner sides of tires as well, and trailer wheels to assure the electric brake wiring is intact.

SEE ALSO

Campers . . . Camping . . . Lubrication, auto . . . Trailers . . . Trailers, tent



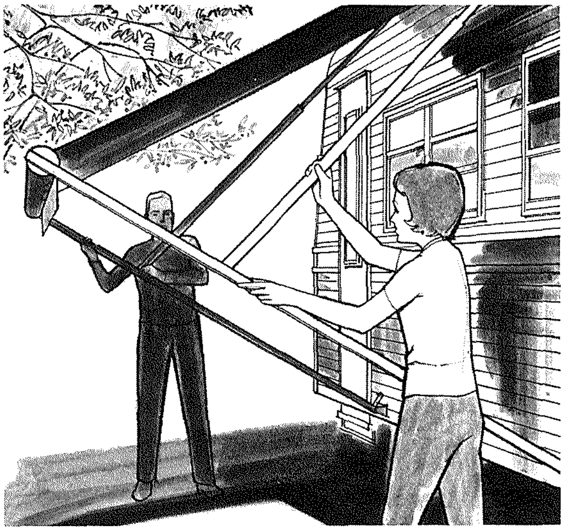
GAS LEAK TEST should be made after every refilling. Paint soapsuds on connections and watch for bubbles.

Check wheel lug nuts with a cross-wrench during regular inspections and daily on long trips. Look for any signs of wheel or rim metal fatigue—radial cracks from the stud holes, for example. Trailer owners may find it worthwhile to have a qualified mechanic repack wheel bearings annually and check magnets and pads of electric brakes. After hitching up, trailer and car brakes should be set to work together or with the trailer's just ahead of the car's.

leaking gas

Start a vacation or winter weekend with liquid-petroleum gas tanks full. Right after filling, check for leaks, especially at valve and regulator connections. Apply soapy water with a half-inch paintbrush and look for bubbles. Never, of course, use a match or flame.

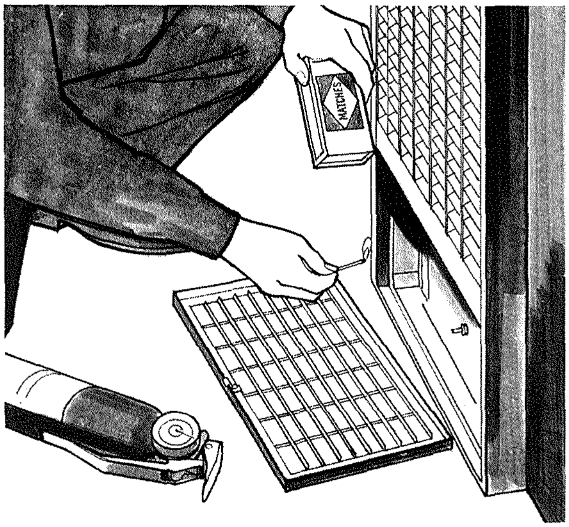
Look over all exposed gas lines under a vehicle; they are vulnerable to scrapes and flying rocks. Check the copper tubing at any point it enters or comes in contact with the frame or body of the RV. The rubber grommets used to protect tubing and wiring at these spots can deteriorate but are easy to replace. After checking the LP-gas lines test each gas appliance while keeping a fire extinguisher handy. Refrigerators, space heaters, stoves and hot-water tanks should be examined carefully. Vibration can fracture hidden lines.



EVEN WHEN RIG is not in use, extend awnings once a month, check the tires, note and correct leaks and rust.

Only the water system needs complete winterizing during cold weather. Most thorough method is to drain all tanks and lines, then blow them out with compressed air through taps and connectors to get all water out of low spots where freeze-up and fracture might occur. Sometimes cracks in the water lines can be soldered but usually the line must be replaced. Be sure to completely empty the toilet bowl. Another method is to refill the water system with a chemical that won't normally freeze and is nontoxic; various brands are available from RV accessory dealers. Traps in the kitchen sink line, bathroom drains and toilet bowl should be filled with permanent-type antifreeze.

During northern winter trips, many campers keep their water system empty and avoid dumping any liquids down drains. Toilets can be used by adding permanent antifreeze to the holding tank and then dumping it before leaving a campground. Self-contained vehicles like motor homes that have continual heat can use all their systems as long as the heat is left on or the vehicle is kept in a warm garage. Once heat is off, the rig must be winterized.

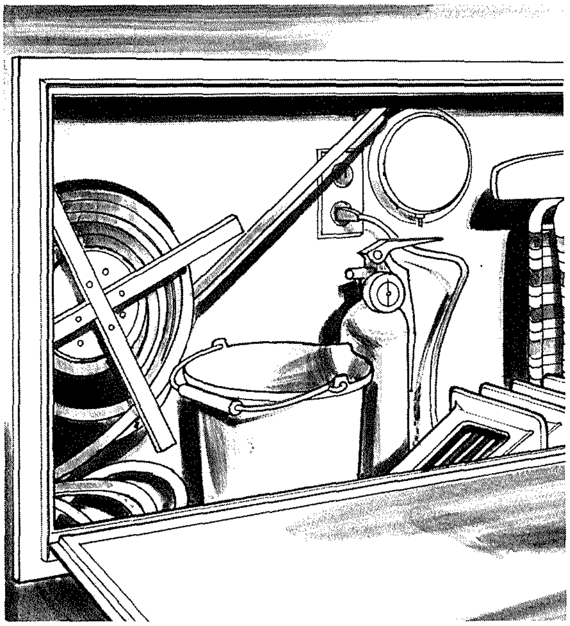


ALL LP-GAS appliances should be lit and examined regularly for operation, leaks. Keep extinguisher handy.

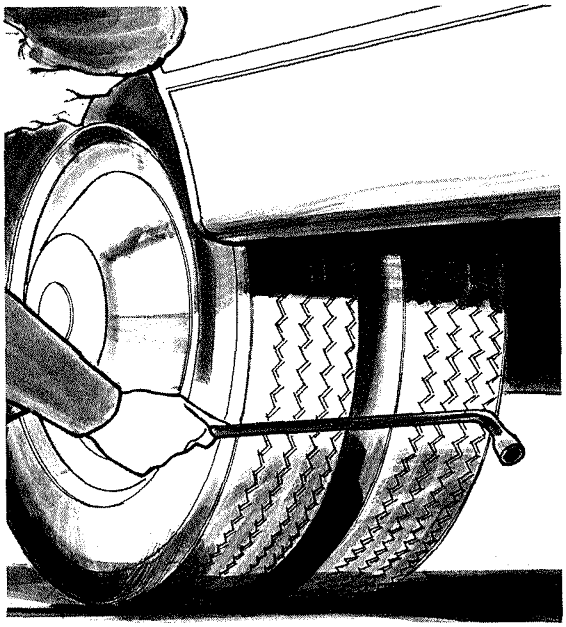
reactivating water system

When reactivating a system, the water tank can be flushed with a sodium bicarbonate solution to get back a fresh taste, though many RV owners prefer to carry a cooler of drinking water and use tank water for dish washing, showers and toilet. Gate valve of a holding tank should be closed and locked before each trip and checked periodically to be sure that no small bits of toilet tissue in the gate are causing seepage.

Most recreational vehicles, especially those without a generator, have both a 110 and a 12-volt system. Plug the 110-volt system into your house current to check it, using a grounded adapter if your house is not equipped with a three-pronged outlet socket. Most 110-volt-system problems are caused by blown fuses or burned-out bulbs. The 12-volt system is a self-contained unit, and a discharged battery may be the source of problems. Many newer trailers include a charger and 110-volt outlet in the trunk as standard equipment. The recharge line from the tow car's alternator to the trailer battery should be fused. Check this whenever the 12-volt system is inoperative, and you will find it is often the problem.



WELL-EQUIPPED RV will carry spare tools, wash-down gear, leveling chocks, rope, wire, hose, gauge, jack.



THUMP INNER TIRE of duals for quick sound-check of inflation. The back-tire pressure is often neglected.

Most 12-volt trailer light problems result from poor connections or ground between car and tow. Remove any oxidation from the electrical connectors with a small knife or fine sandpaper. Cleaning dirt and grease from the hitch ball and spring bar sockets will help create a better ground. If the problem persists, try a line with quick-disconnect alligator clamps from the car's trunk locking plate to the trailer's LP-gas bottle tie-down post. "Hot skin" that gives you a shock when you touch your RV can result when insulation has worn off a 110-volt line. Polarity may be reversed if you are connected to an ungrounded two-prong outlet. Disconnect immediately and try to track down the cause. Rewiring your rig may be necessary.

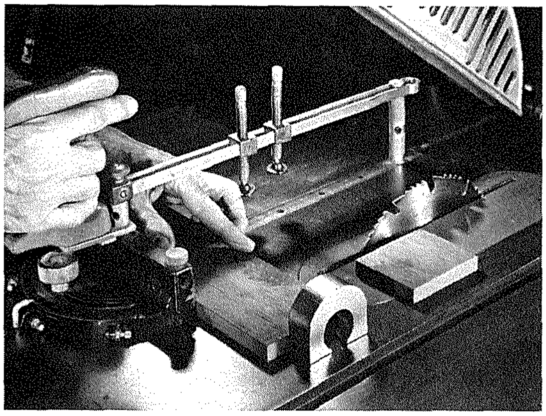
Every time your tow car is up on a garage hoist for a lube and oil job, check the hitch portion bolted or welded to the frame. And before installing the ball and riser assembly into the hitch receiving tube platform on a car, check for cracks, especially where the shank meets the bottom of the ball. Changing the ball every two years is an inexpensive item and well worth the added safety of a new part. Check the welds on ball and riser for hairline fatigue cracks. Replace the assembly; do not try to correct by further welding. U-bolts on the trailer portion of a hitch can work loose and should be inspected and retorqued as required. Clean the mating surfaces between hitch and antisway device, but do not grease or lube these surfaces to make them ride quietly. This will prevent the antisway action basically caused by friction. And before leaving the driveway, check brake response, all stop, clearance, signal and brake lights, breakaway switch and safety chains.

For really cold camping, storm windows are available to fit into the slots used by screens in summer. Some RV families merely tape clear plastic over the windows to keep heat in, cold out. For extended winter use, your heater should be equipped with a blower for better heat distribution. Use of electric heaters is common, but can blow campsite fuses or cause a fire if a youngster kicks a blanket over one on the floor. Use them only with the greatest precautions.

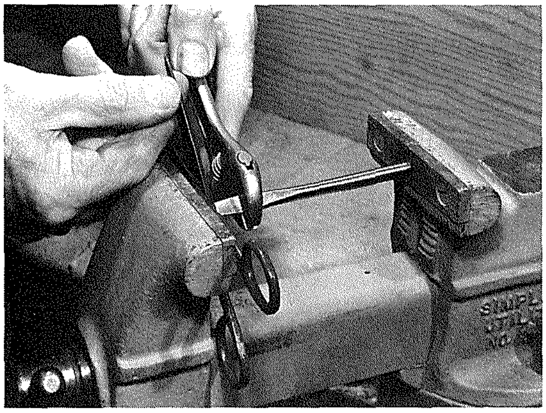
maintain airflow

Sufficient oxygen in the small confines of an RV is an important winter consideration. Airflow under a rig should not be blocked off if the heater is vented through the floor. At least one window or ceiling vent should be left open about one inch to assure air to breathe.

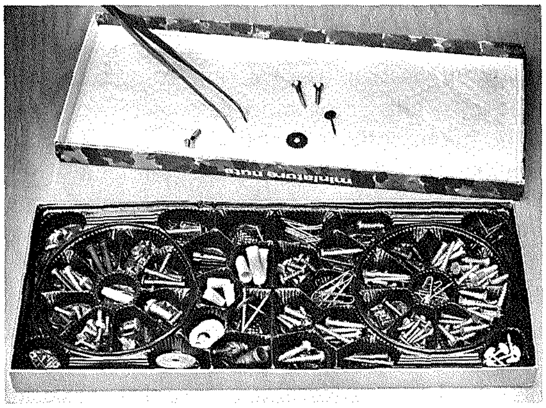
Off-season suggestions include jacking up your rig, removing tires, wheels and battery, taking down the curtains and covering seats with sheets or newspapers. This does no harm, but better than decommissioning is keeping your RV ready to go and using it throughout the year.



A MAGNET CAN SIMPLIFY your next woodworking project which calls for cutting a number of pieces of wood to the same length. Set a suitable magnet on the metal table of the saw and use this as a measuring guide. It's important, of course, not to hit the magnet with the end of the work, as pressure against the magnet will cause it to slip out of position.—*H. E. Roberts.*



TIGHTENING AND REMOVING the screw holding the two sections of a pair of scissors or shears can sometimes be a difficult task. Try drilling a shallow hole in one jaw face of a sturdy shop vise, then insert the end of a short, stubby screwdriver bit into the hole. Using the vise as a press to hold the screwdriver bit in the screw slot, you'll find that a wrench slipped over the flat end of the screwdriver will provide enough leverage to turn the screw.—*H. Josephs.*



THE NEXT TIME you buy a box of candy, make sure the inside of the box has the one-piece plastic divider that holds the candy in place. Then, after helping to empty the box, snap up the remains and carry them off to your workshop. There, you'll discover, the box is the right size to fit inconspicuously on a shelf—and the dividers in the box make ideal storage compartments for such workshop miscellany as screws, nails, nuts and washers.—*Joseph Braunstein.*

THESE FEW STEPS take only minutes, yet they allow you to keep a roofing brush soft for days, even weeks, between tarring sessions. First moisten the brush in kerosene, then work out the excess by brushing over old newspapers or over an area to be tarred later. Next wrap the brush with a few layers of newspaper, enclose it in a plastic bag and bind the bag tightly around the handle with a cord. Be sure the seal is airtight, or the brush soon will dry out.—*Walter E. Burton.*

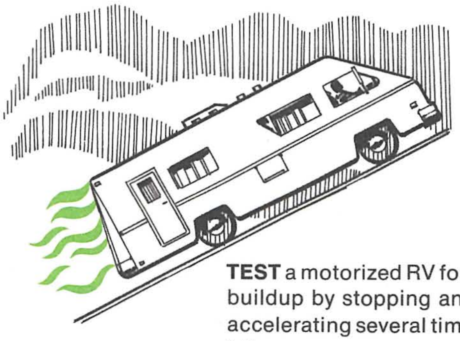
How to buy or rent a used RV

By WAYNE HARRIS

Recreational vehicles are a big investment. If you are buying a used one, be sure to get your money's worth. The best way to try one out is to rent it. Here's what to look for when you go shopping

■ WITH OVER 4 million used recreational vehicles around, there are plenty to choose from for the camper who wants his fun on the go. Good older models are cheaper now, and if you still can't afford your choice—form a club (as boatmen and pilots do) and buy your dream machine as a joint venture.

Having several people check over your selection is a good idea anyway. Second-hand RVs can have all the problems of a car *and* a home. RV performance and appliances differ from autos and houses, however. It is well for a newcomer to rent first (see checklist at right) to learn which type of vehicle is best for him, and how all the gadgets work and are maintained.

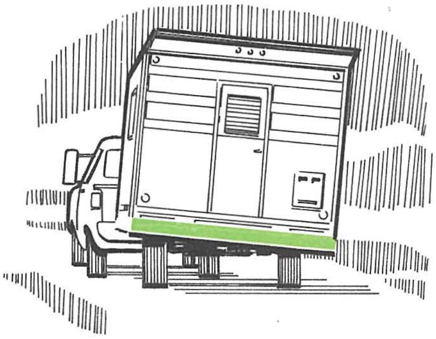


TEST a motorized RV for heat buildup by stopping and accelerating several times on hills.

First, look over the outside of the rig. Any dents, punctures, rust spots on the sides? Loose plumbing underneath? Gouges in the roof? Many owners have driven through the woods where low branches could rip the top, but have never used a ladder to climb up and check the roof condition. Dents won't matter much, but a hole that has let in rain could have caused inner-wall damage that may not show. Small side repairs can often be made inexpensively with epoxy putty. But a smashed corner where roof and two sides meet, or the bottom panel of a rounded metal-riveted coach, where other panels may have to be removed, might take up to a $500 professional repair. Get estimates and a deduction from your purchase cost.

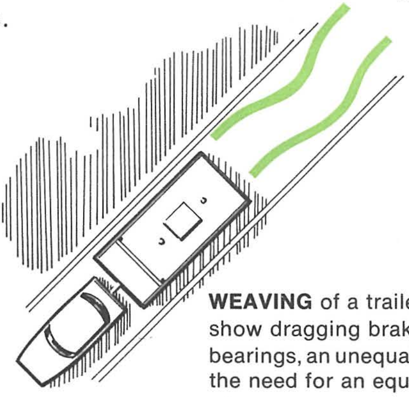
SEE ALSO

Campers . . . Camping . . . Trailers . . . Trailers, tent



A LEAN to the side, tongue-heaviness or back droop can indicate bad springs and loading.

Rips in the canvas of a tent camper can be repaired by an awning shop, or possibly replaced by the manufacturer if you are buying a model from one of the long established companies. Flat fiberglass punctures are easy to fix, but slashes or broken curved contours may require a quote from an RV or boat-repair shop. An auto-body shop can give an estimate on steel frame and sheet-metal work. And look at the tires. Replacement could cost under $20 a pair for a small trailer to several hundred for a set of steel-belted radial wide ovals on a big motor home.



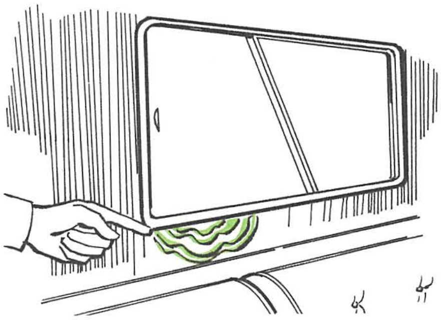
WEAVING of a trailer may show dragging brakes or bearings, an unequal load, or the need for an equalizing hitch.

Inside the rig, jump on the floor and push on the walls. If construction seems flimsy, pass it up. Stains around windows and vents may indicate minor leaks that can be inexpensive to seal and fix, or a hatch left open by mistake during a rain squall. But water seepage into inner walls may have started wood rot and structural problems. Fill all water tanks and look, as well, for leakage from plumbing. Accessible joint leaks can be cured, but tearing out walls to find a break could be too expensive.

All LP-gas and electric appliances—stove, lights, refrigerator, furnace, air-conditioner, water heater, pumps, intercom, plug-in outlets—should be operated long enough to be thoroughly tested. Using a well-tuned TV set, does the picture roll because the generator is off-cycle? At least you know before you buy.

Musty interior? It may be evidence of soggy inner walls. Proceed with caution. Lots of dust around? The rig may have a sprung door or windows that don't quite close. Tap water discolored? Toilet holding tank clogged? Find out why before you buy. An RV dealer can give you replacement costs of a new stove, toilet, furnace or refrigerator. You may arrange to have the expense deducted from the purchase cost.

A road test is essential for a motorized RV and helpful with trailers as well. Does the trailer or mounted pickup camper lean to one side? Check for broken springs. A rig that sways and fishtails may require an equalizing hitch. Test brakes and check wheel bearings as well.



LEAK MARKS around the windows? Sealant should fix this, but check for wall damage.

A pickup camper body must be removed to check the condition of the cargo bed, camper floor and jacks. Underway, watch for excessive sway, rear sag, fender rub. Try to test a motor home for several hours, stopping and starting on a steep hill to check overheating, transmission slip, ping, brake fade and wheel-bearing squeal.

Bargain orphan RVs are around from companies no longer in business. But you may never locate replacement parts.

RV rental checklist

☐ Is this the RV for you? First be sure the rig is big enough for your family, hunting and fishing buddies, or in-laws—whatever the size of the gang that's going along. A cute little "six-sleeper" may be comfortable at night for only four adults.

☐ Enough room and privacy? If you're trying to sell your wife on the sport, be sure to pick a model she feels comfortable in, and won't catch cabin fever if a long, rainy weekend cages you all inside with the dog, cat and kids. Rent one with an enclosed bathroom and more space for longer trips.

☐ Big motor home? Little van conversion? Pick-up camper? Travel trailer? Tent-type camper trailer? Look over accommodations and accessories of each. Take a short trial trip near home first.

☐ How does it work? Part of your rental fee should include a complete demonstration of all features and appliances before you leave. Ask lots of questions, even if you think you know the answers. The water pump, toilet, galley or furnace may work differently than others you've seen in use. If the rental dealer can't give you printed instructions, take notes. If he doesn't have time to let you open the tent trailer, start the generator or light the oven while he watches, shop elsewhere.

☐ Can your car tow the rig? Makeshift trailer hitches are unsafe with any trailer. For rigs over 1500 pounds, consider a load-equalizer hitch. Is your car in shape to pull a load behind, stop it, lug it up hills in hot weather? Ask a mechanic who knows. Add extension side mirrors if rear vision is impaired.

☐ Does the refrigerator work? Many new RV renters don't know they may need a bubble level to be sure their LP-gas refrigerator base is absolutely horizontal.

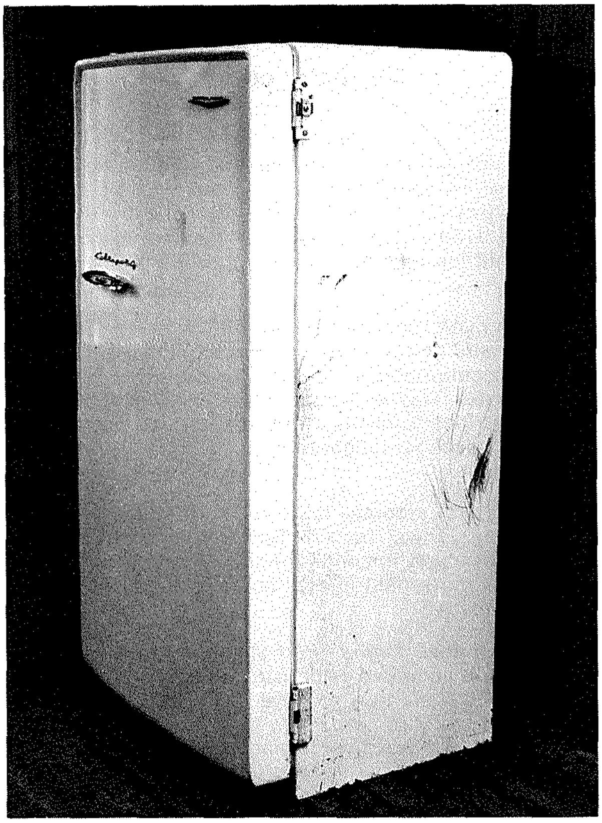
☐ Does galley faucet produce water? Have dealer fill your tank and show how hand, electric or air-pressure water system works. Note if tank makes water smelly or unpalatable.

☐ Electric lights turn on, appliances work? See if heavy-duty extension cord for campground outlet is supplied, if auxiliary battery for lights supplements engine-starter battery.

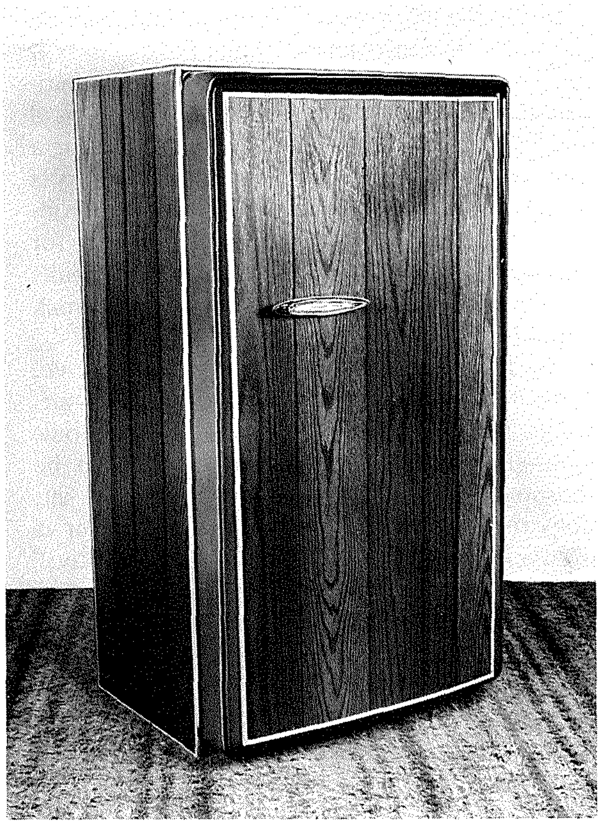
☐ Generator supplied? Learn how to start and service it. Locate 110-volt outlets.

☐ Toilet aboard? Find how it works, when and how it is emptied.

☐ Water heater? Learn how to light it.



BADLY IN NEED of refinishing, this 12-year-old refrigerator was a good candidate for paneling-and-aluminum modernization because of its dated design.



DARK OAK PANELS framed with satin-finish aluminum give the updated refrigerator a rich look. Brown spray enamel makes the door harmonize where it shows.

New look for an old refrigerator

By ROBERT WORTHAM

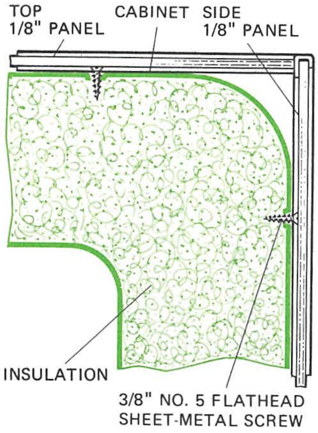
▨ IF A RECENT kitchen-remodeling job has your old refrigerator in need of a facelift, or you've bought a new refrigerator but kept the old one for the family room, you can panel it with wood for a clean-line modern look. The contrast of wood grain and narrow, satin-finish aluminum molding will take years off its appearance.

The average-size 10 to 14-cu.-ft. refrigerator will require one 4x8-ft., ⅛-in. panel (perhaps the same paneling you've used in the family room, or one that will match your kitchen cabinets), 45 lineal ft. of ⅜-in. lipped aluminum cap molding, ⅜-and ¾-in. No. 5 flathead sheet-metal screws and a can of spray enamel (same color as the paneling) for exposed areas of door and cabinet not covered by paneling.

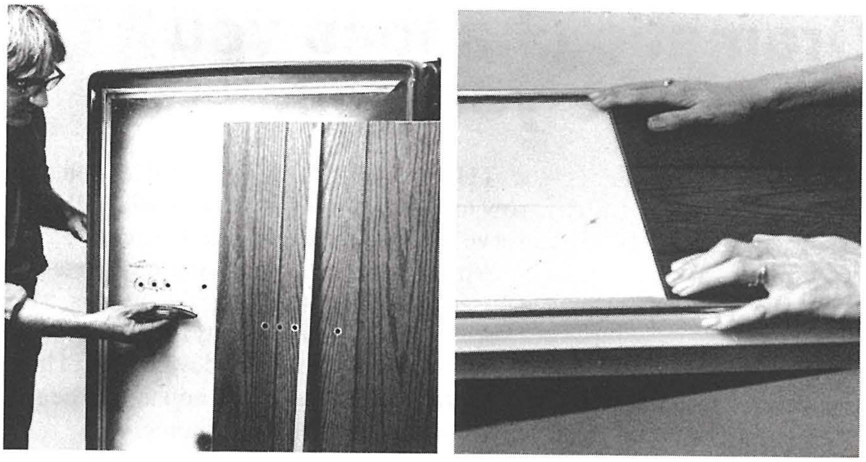
Start with a side panel, attaching front vertical and bottom molding strips through wide lip of molding with ⅜-in. screws. Slip panel into place and attach rear vertical strip with ¾-in. screws through molding. The top molding strip, capping the top edge of the panel, is attached with contact cement—*caution:* contact cement is extremely flammable, so read and follow maker's instructions. Follow with the top, second side and door panels (the door panel and molding may bend to follow door curve). Finally, replace door handle and latch assembly, inner door and basket.

SEE ALSO

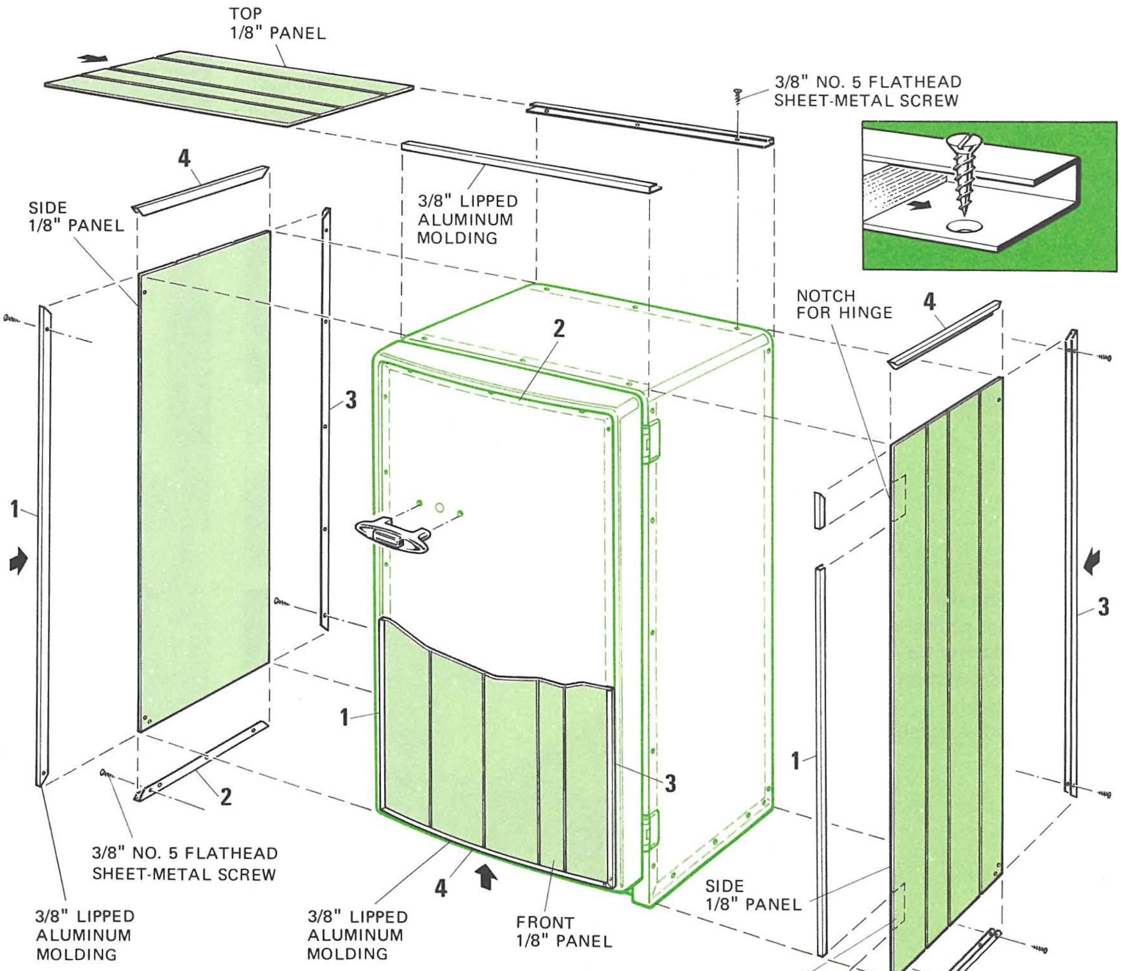
Appliance centers . . . Freezers . . .
Garbage disposers . . . Kitchens . . . Mixers, food . . .
Oven hoods . . . Paneling, wood . . . Ranges . . .
Toasters . . . Trash compactors



SECTION



GASKET AND inside panel are removed so that the door handle assembly and nameplate can be detached. Door edge is spray-painted to match paneling. Except for two strips on top, which butt against strips on top edges of sides, all moldings are mitered. Top panel slides into place after the top strips and one side panel have been installed. Then the second side panel can be put into place.



Dramatic changes you can make yourself

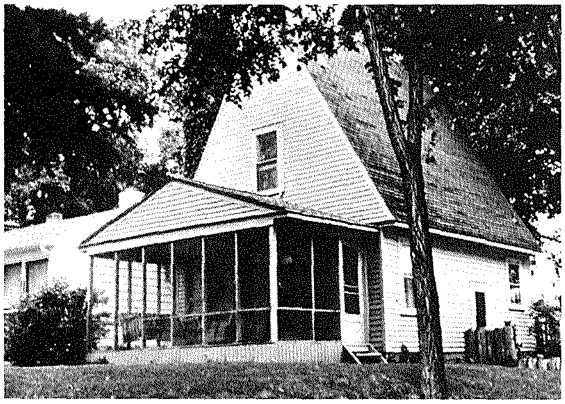
By HARRY WICKS

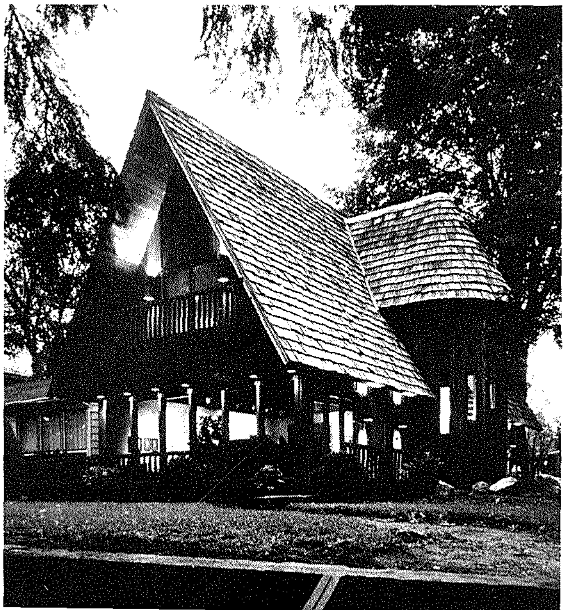
▨ THE DRAB-LOOKING HOUSE on the narrow lot in the photo below was originally built to serve as a lakeside summer home.

When new home prices and mortgage money started to spiral out of sight, the owners, Mr. and Mrs. Roger Wothe of Wayzata, Minn., abandoned their search for a new home. They decided they could get more house for the money remodeling their weekend home.

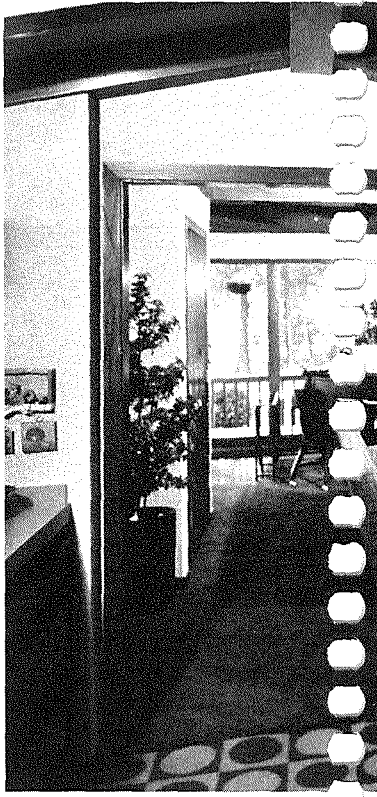
The house was full of problems, almost too many to solve. The living area was inadequate for the owners and their two growing boys. And the narrow parcel of ground ruled out any expansion into the side yards. Combined, the two levels had a scant 960 sq. ft. of living space. A complete front-to-rear remodeling changed the picture.

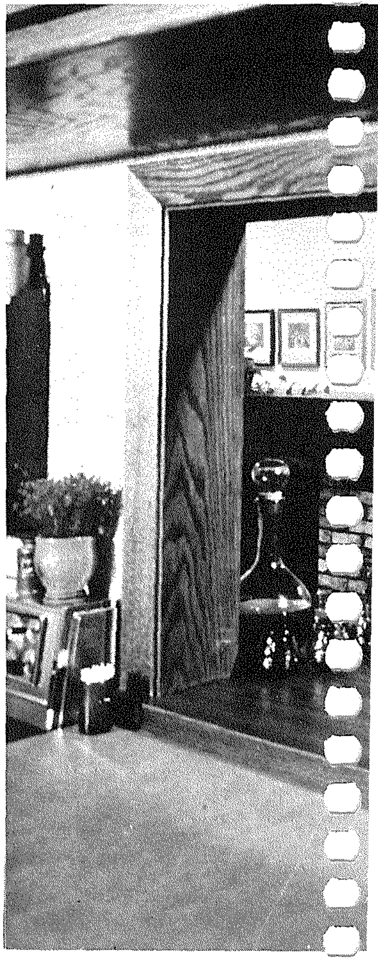
Roger Wothe, who heads up Environments, Inc., a firm that specializes in store interiors and fixtures, designed and implemented the changes himself. Before he ever lifted a hammer, he spent one year in the planning and drawing stages.





AS SHOWN in these before and after photos, the house underwent a dramatic transformation. You might not even suspect it was the same house.





THESE PICTURES of the kitchen and dining area show the pass-through connecting the two. Also shown are the contemporary-styled cabinets. These have been equipped with invisible latches for a more modern look.

"The floor plan was opened to all kinds of possibilities," he said, "but things started to happen when I made the decision to move the stairs outside."

The first step was to build a new circular staircase in a round "tower." What had been a small deck in front of the living room was then enclosed to double its size. Twelve feet were added to the rear of the house and interior partitions were reshuffled.

With remodeling completed, the chalet-style boasts an impressive 1900 sq. ft. of living space laid out for a lot of living. It is chock-full of dramatic and sensible ideas. Some features can be duplicated easily; others require professional know-how. All are handsomely designed and installed with care. Whether you are a do-it-yourselfer or prefer to hire others to make renovations, you're almost certain to spot some ideas that seem made to order for your house.

As shown on the previous page, the dramatic change is obvious in the "after" shot of the completed remodeling. The tower which houses the circular staircase blends well with the chalet styling, and by breaking the severe slope of the roofline adds interest and pleasing balance. It creates the impression that the whole house is wider than the original building when in fact it is not. The tower windows are insulated units manufactured by Viracon, Inc.: they're designed to be heat-absorbing and glare-reducing.

Wothe wisely made an asset of that huge expanse of exposed roof by covering it with attractive, handsplit cedar shakes. A wood preservative was applied and the shingles were left to age naturally.

The existing roof line was continued over front and rear additions to integrate the design.

The new roof was planned with energy conservation in mind, too; A 6-ft. overhang was added to the length of the house on both sides to shield it from the summer sun, which would tax the airconditioning system. But the design admits warming rays from the lower-angled winter sun to assist the heating plant.

The rough-sawn cedar siding enhances the natural beauty of the house's lakeside site. The siding was finished with Olympic's No. 714 stain and the trim with Olympic's Coffee stain.

SEE ALSO

Basement remodeling . . . Family rooms . . .
Garage remodeling . . . House additions . . .
Kitchens . . . Remodeling, exterior . . .
Remodeling ideas . . . Spiral stairs

THE NEW LIVING ROOM features beamed ceilings and lots of glass for an open look.

Rather than hide the exterior doors with storm or screen doors, Wothe installed Taylor insulated steel doors (which eliminate the need for either). Door exteriors were painted with epoxy enamel and the interiors were covered with a Formica wood-grain pattern matching the interior oak trim.

The remodeled and enlarged kitchen has a false A-ceiling. Space created between it and the old ceiling is used to route wiring, pipes and ductwork. Gone is the bothersome stairway that had cramped the old kitchen. In the expanded area now appears an appliance and cabinet layout that would please the fussiest of chefs. The kitchen is flooded with light; eight Lightolier recessed-can fixtures installed in the ceiling are angled to provide even, shadowless lighting.

The 6x6-in. ceiling beams are also false. Hollow and fashioned of red oak, they—like all interior trim—are finished with Pratt & Lambert's Oriental Walnut oil stain. To minimize daily upkeep, kitchen walls are treated with Jumbo Weave (by Fashon), a fabric wall covering that resists bumps, bangs and scrubbing. For underfoot comfort, the Wothes finished the floor with Dimensions, a Polyester III commercial carpeting by Viking.

If there is a single attention-getter in the kitchen it is the functional pass-through connecting kitchen and dining room. What used to be a doorway was closed at the bottom and neatly framed with trim. The countertop was built to create a 12-ft.-long ledge (not visible in the photo) on the dining room side for buffet-style entertaining.

Another reason for the opening was to allow better use from the dining-room area. Perched on stools, the Wothe youngsters use that side of the counter for breakfast, lunch and snacks. The dining room wall seen opposite the pass-through is clad with ½-in. plywood (instead of plaster or plasterboard) and covered with Fashon Jumbo Weave. The owners periodically change picture groupings—this wall lets them drive nails wherever they want without the need for patch jobs.

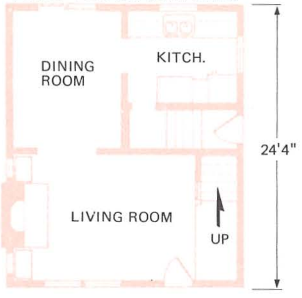
The living room was doubled in size when the additions were completed. The two walls facing the lake were opened up to let in the view—but not the heat. Fixed sash here are also of Viracon,

A SKYLIGHT above the shower is used to bring natural light into the bathroom as shown at left.

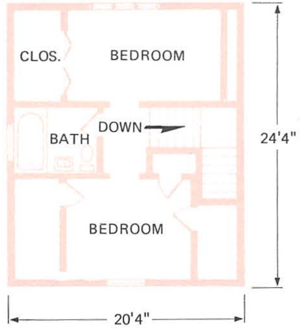
THE TWO WINDOWS that used to flank the fireplace have been closed and replaced with a slit window at the right.

THE VANITY shown below was built by the owner to complement the matching drapes, ceilings and walls.

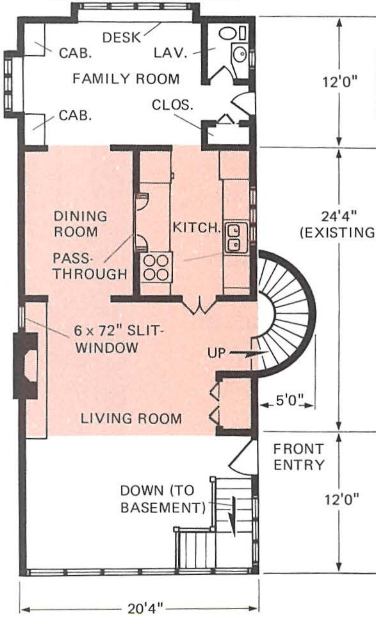
FIRST FLOOR (BEFORE)



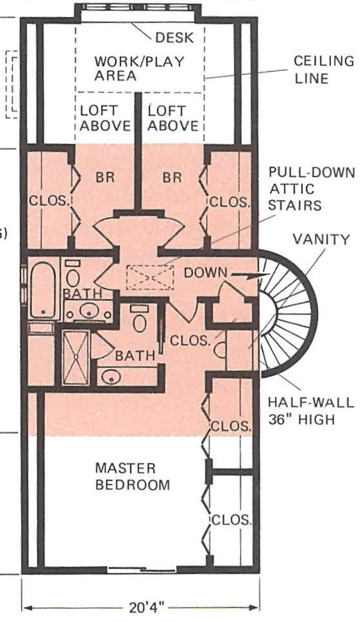
SECOND FLOOR (BEFORE)

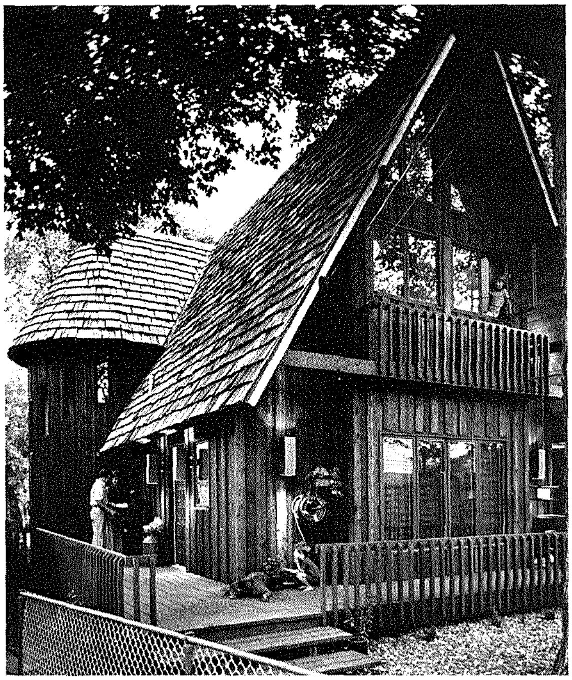


FIRST FLOOR (AFTER)



SECOND FLOOR (AFTER)





THE LILLIPUTIAN SIZE of the lot that this home occupies is appreciated when you know that the fence in the foreground separates the Wothe property from a neighbor's. The railing on the second level (false balcony) de-emphasizes the tall look and repeats the balcony detail on the house front. Generous use of wood decking creates an illusion of a larger house and lot. The view of the house from a distance shows how railroad-tie walls blend with the styling.

while all operable windows are Andersen Thermopane. The owner made the frames.

The pair of "useless" fixed windows flanking the fireplace in the original living room were closed in, and a 6x72-in. slit window was installed behind the mantel. Note that this window is the only opening on that sidewall. It creates a dramatic focal point as light streams in over the heavy mantel. The fireplace was enlarged and a massive, rough-hewn mantel added.

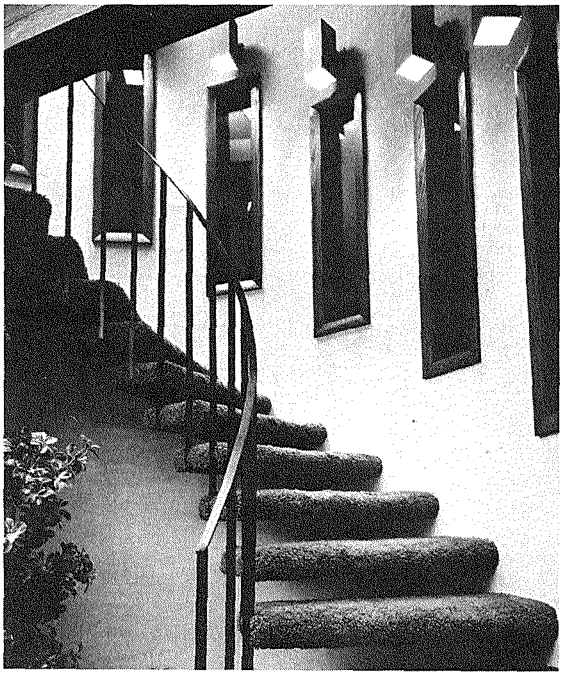
The shower in the bath added off the master bedroom has a skylight because this was the only way natural light could be brought into the room. The ceramic-tiled stall shower has a door that's framed in bronze metal to match the vanity mirror frame.

A new look for the old bathroom was created by using drapery that matches the walls and ceiling. The pattern shown is a cotton fabric from Design Group II.

The active pattern on the walls, ceiling and drapery underscored the need for a handsome vanity design that would hold its own. Built by the owner, its luxurious sculptured look was achieved through the use of standard lumberyard moldings.

For structural reasons, the stair tower is erected on a concrete slab. Such a construction provides a solid base for anchoring circular stairs. Treads are cantilevered from the wall, thus eliminating the need for a post. Because of this, the handrail runs around the inside perimeter of the treads—rather than the outside—which is typical of factory-built circular stairs.

THE CIRCULAR STAIRS were precut in the shop, then assembled and welded at the job site.



You can get a new home—without moving

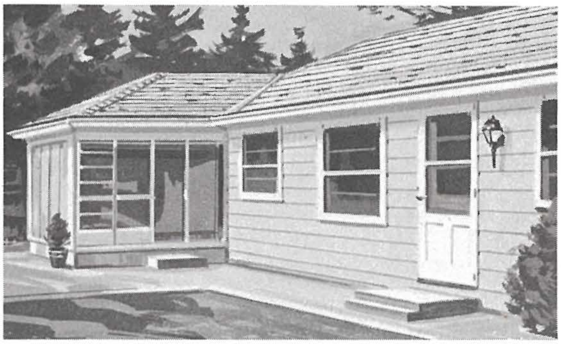
By HARRY WICKS

■ TODAY, ADDING TO or remodeling your home, rather than searching for a newer, larger house, is often the wiser choice for a homeowner. Depending upon size and selection of finishing materials, it is almost certain to be the less expensive approach.

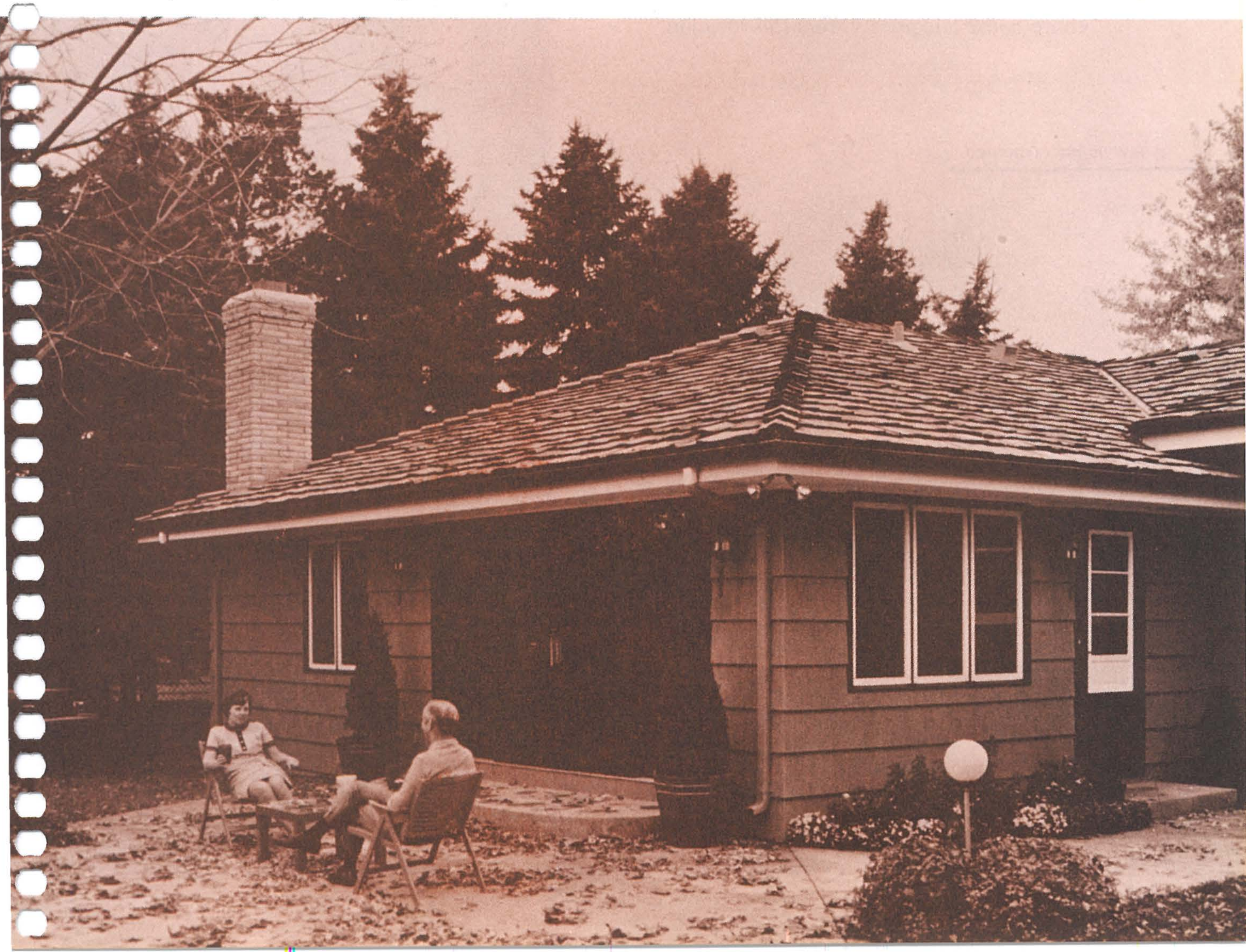
Money isn't the only factor. Most of us like where we live, and if you have youngsters in

SEE ALSO

Family rooms . . . Garage remodeling . . . House additions . . . Kitchens . . . Measurements . . . Remodeling, exterior . . . Remodeling ideas



SKETCH shows original porch that was enlarged to 16 by 30 feet to yield a family room and larger kitchen.



school, a family shift will require more than a few adjustments.

Since the property that this Minneapolis family owned would permit them to build the room they needed, their decision was to stay put and add on. They also increased their living area by adding a lighted patio. And, since the original house was due for a reroofing, the entire house was covered with hand-split cedar shakes.

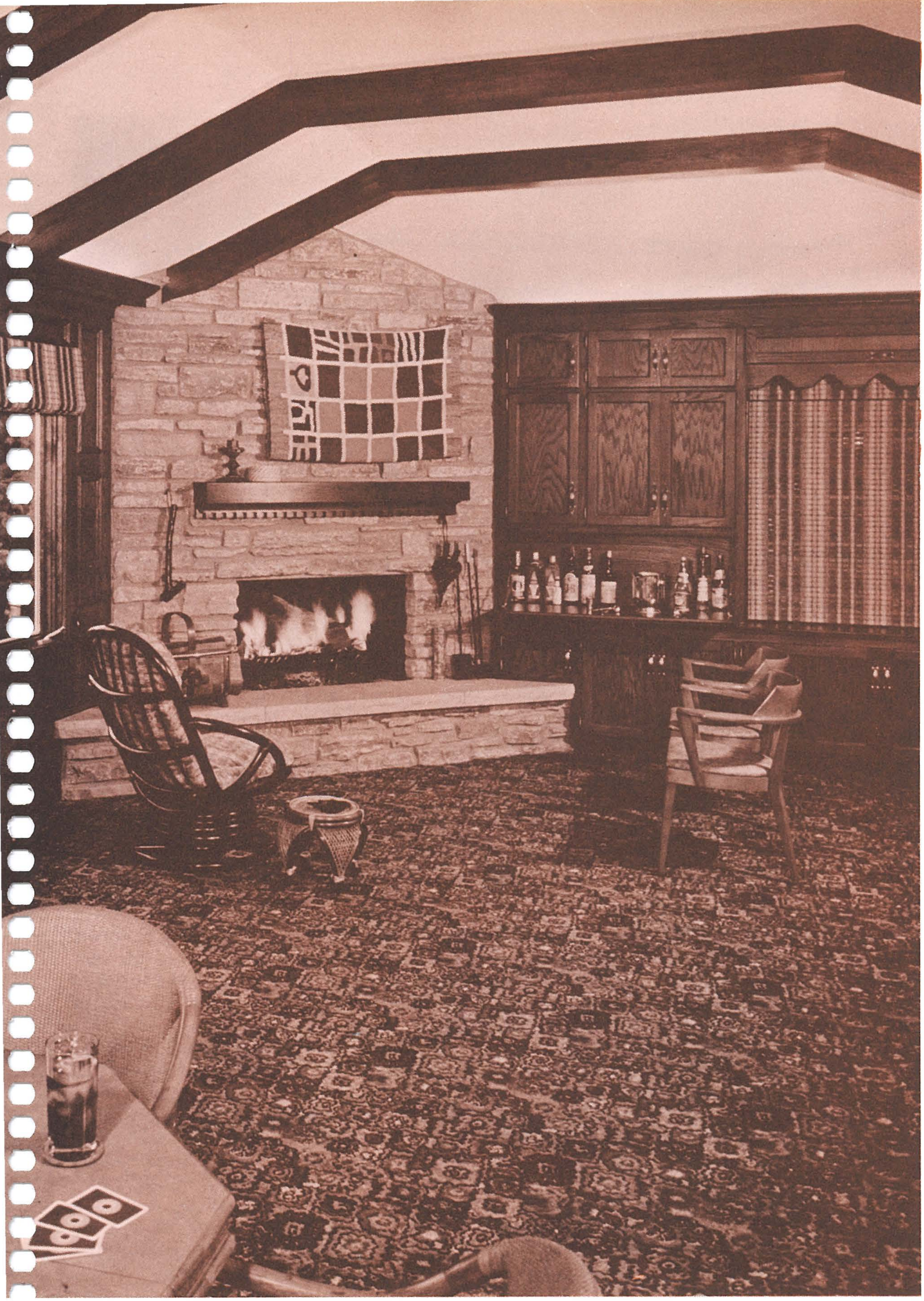
The vaulted ceiling is simply ½-in.-thick plasterboard over 2x6 collar beams. To finish, the plasterboard was heavily textured with paint and the joints covered with decorative oak beams.

For general use, the lighting concealed behind the wood soffit close to the ceiling gives sufficient illumination. It consists of fluorescent strips which reflect off the painted ceiling. For decorative appeal, oak dentil molding was used around the room where walls and ceiling meet.

The original heating plant was capable of handling the new room; thus, it was not necessary to install new heating equipment. But the builder did relocate the thermostat, placing it in the new room. The single thermostat handles the entire house adequately from this location.

a new home, continued

CAREFULLY planned addition has bypassing doors located to give the best view of the outdoors. The fireplace is built of kasota stone and has an oak mantel.



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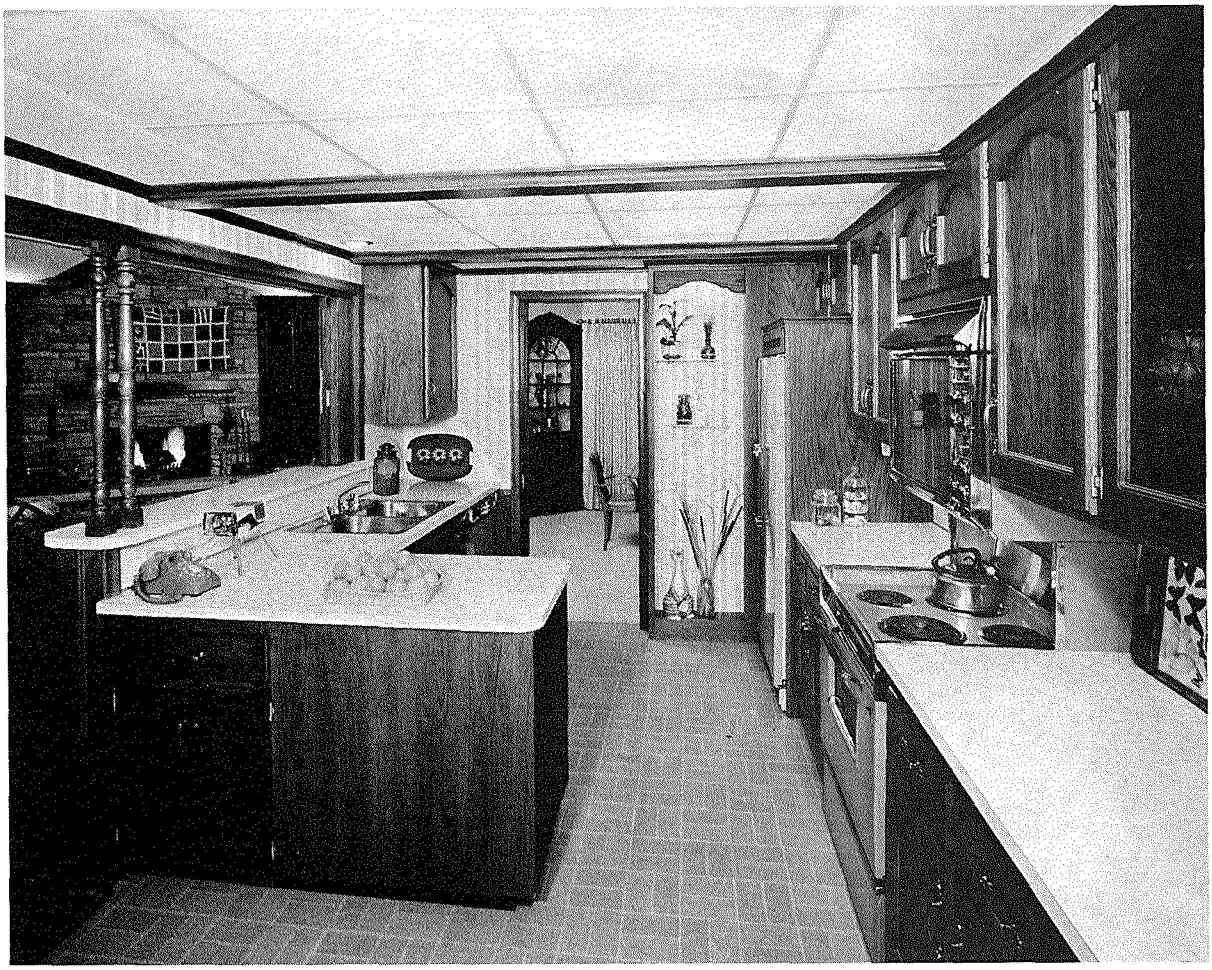


ENLARGED KITCHEN features a luminous ceiling. Oak beams were added for a visual tie-in with the new room. The cabinets are also of oak with a suede finish, white laminate was used on the countertop.

Desiring overall, even lighting, rather than one or two ceiling fixtures, the homeowner chose a luminous ceiling for the kitchen. Even here, the owner decided to "customize." The plastic, which comes in 2x4-ft. sheets, was halved to create 2x2-ft. sections. Installation was standard using the metal grid system. For visual tie-in with the family room, simulated beams were spaced at intervals across the ceiling.

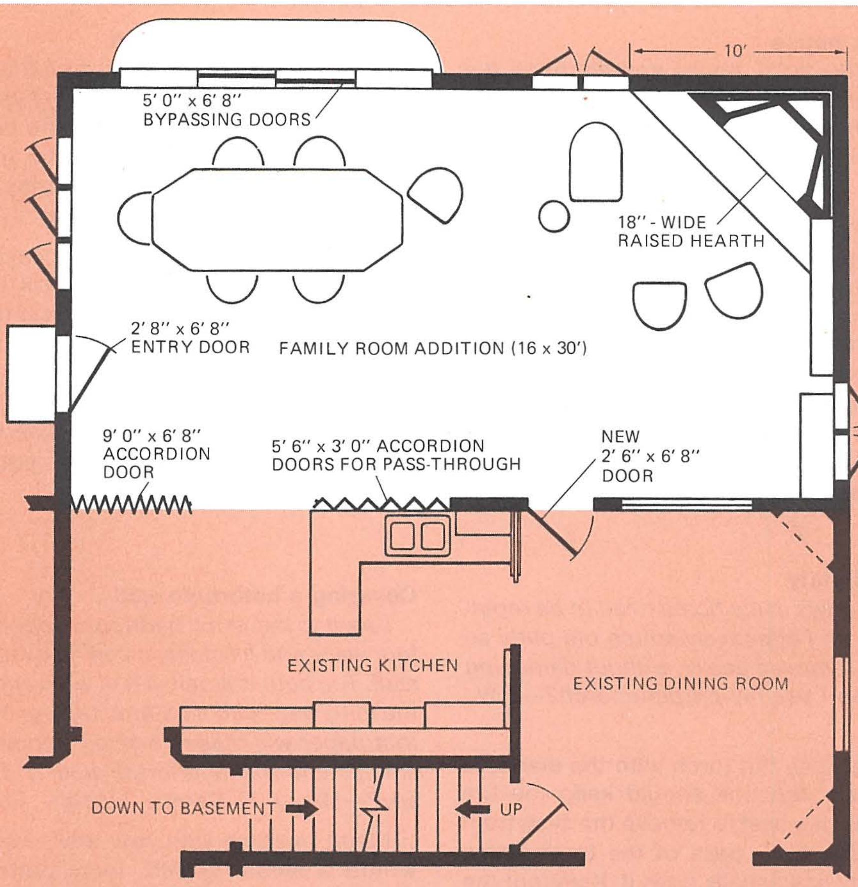
The kitchen cabinets, custom-made, are also of oak. As seen in the photos and floor plan, strategically placed accordion doors can be kept open for general everyday use or closed when desired. They were placed at the peninsula counter so that area can be left open.

The brick-patterned vinyl flooring was picked up from the old kitchen and relaid.

To make the step platform by the sliding doors, slate was simply embedded in concrete. The concrete patio has a smooth steel-trowel finish and raked lines radiating from the platform. The outdoor lighting was solved by simply setting a plastic globe on steel pipe, which, of course, is erected in a footing.

What makes this addition particularly attractive is continuity of design, both indoors and out. It is obvious that the homeowner and builder worked closely together on the project and it shows in the finished product. The new hip roof ties in perfectly with the existing house roofline. And that is important. A poorly or hastily conceived addition will almost always result in a structure that has a tacked-on look. This is something to avoid if you want to add to, rather than detract from, the value of your home.

It might even pay to have an architect look at your home and make suggestions so that you will avoid this common pitfall.



ACCORDION DOORS are used when it is desirable to hide kitchen from view. The floor plan shows how careful planning insured that this addition would integrate with the existing home.

Painting brick house

I own an older brick house and although the brickwork is still in good condition the structure is of a style I think would look better painted. But my wife says no. Can you help us decide?—F.M., N.Y.

This question comes up for discussion often. I'm inclined to agree with your wife. I, too, don't like painted brickwork; any painted masonry, in fact. There's another factor: Paint on masonry, also brickwork, tends to weather rather rapidly, resulting in a grayish, patchy look that's not pleasing to the eye. You can give some old brickwork a freshened appearance by coating it with a masonry sealer, which is a colorless liquid similar to clear varnish.

Softening old putty

Several windows in my home need to be reputtied. But how do I effectively soften old putty so that it can be removed easily, without damaging the wood? Can I use my propane torch?—E.W., Pa.

Yes, you can use the torch with the standard head, or nozzle, but one should keep the fire hazard in mind. It's best to remove the sash from the frames. One slow pass of the torch flame along the putty line usually does it. Knife out the softened putty immediately, also any paint on the frame that is softened; you'll have to repaint anyway. If the first pass doesn't get all the old putty, make a second sweep of the flame but be sure to keep it moving fast enough to prevent charring of the wood, or breakage of the glass pane.

Accelerated oxidizing

I have a jardiniere which I'm told is copper, and I'd like to color it that greenish verdigris, as I believe it's called. How can I do this in a hurry, without waiting for it to form naturally?—Hal Worden, Sioux City, Iowa.

If the jardiniere has value as an antique, I'd leave it as it is. If not, you can get something approaching natural coloring using a mild oxalic-acid solution. Clean the copper, then make a solution by dropping a couple of average-size oxalic-acid crystals into a gallon of water in a ceramic container.

Caution: Don't pour water on the crystals. Wear rubber gloves and eye protection. Use a cotton swab to apply the solution. After half an hour to an hour, rinse with clear water. When the metal is dry, the color should be uniform if you've been careful not to skip any areas.

Baffling fireplace problem

I like a blaze in my fireplace on those rainy fall evenings and several times when I've started the fire I can smell wood smoke in the basement, of all places! No smoke comes from the fireplace into the room. Neither I nor a neighbor have been able to figure this out. What gives?—W.N., Mich.

On those evenings when you enjoy your fireplace the air is "heavy," so to speak. Smoke from the flue trails downward, even near ground level in some instances. A slight stir of air outside can bring it in through your basement window; hence the odor of wood smoke in the basement. This is not a common atmospheric condition, but it does happen. You're fortunate that you don't get smoke in the family room.

Covering a bathroom wall

I want to paper my bathroom floor to ceiling on four walls and from tile to ceiling over the shower stall. The bath is small; 3 feet wide and only 8 feet the long way, with an 8-foot ceiling. Now I'm told that paper will make so small a room look even smaller and will deteriorate quickly. What do you say?—Mrs. J. N. Carney, Lincoln, Neb.

I tend to agree with your advisers—especially where a small-figured, busy pattern is concerned—but this is not to say that paper should not be used. Judging from the size of the room, I think it would be better to paper only three walls and paint the wall above the shower, or perhaps paper just one wall.

Your wall-coverings dealer will recommend the type of coated paper or fabric to use. Wash, rinse and dry the walls thoroughly before you apply it.

Paint tubs if you must

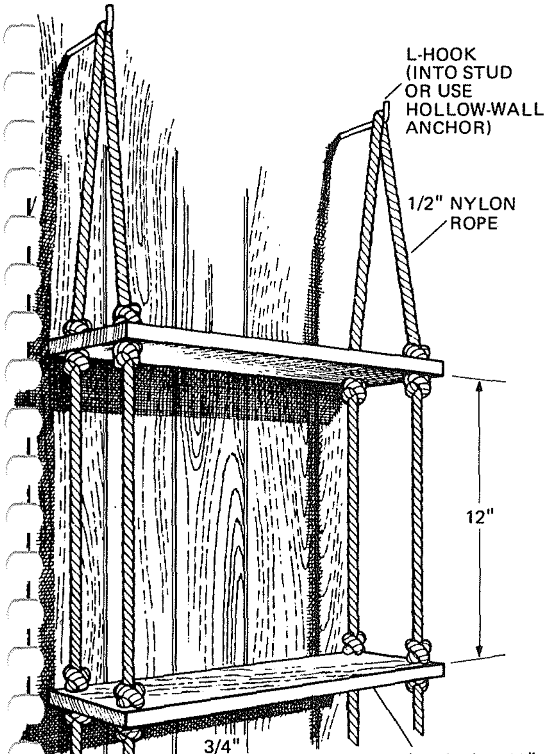
Can I paint my basement laundry tubs, inside and out? If I can, what paint should I use?—Miles Proctor, New York.

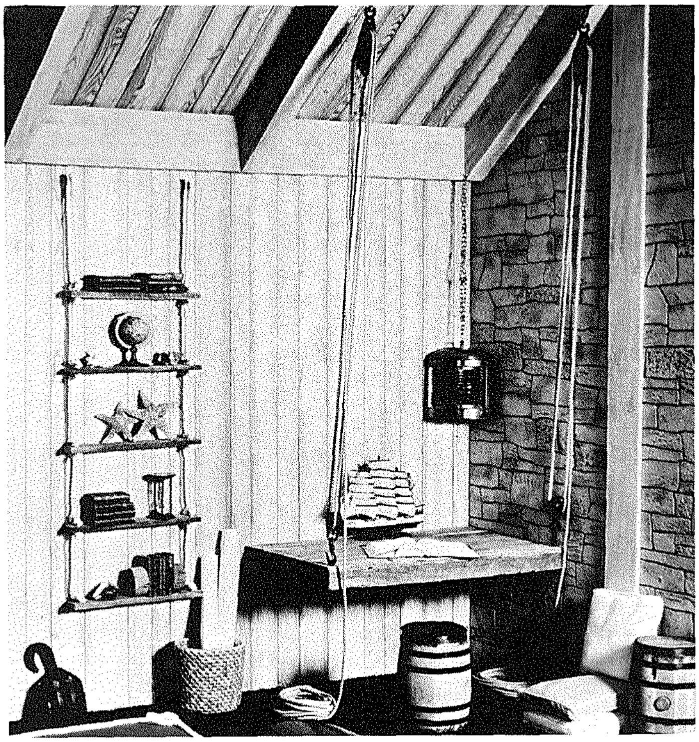
You can paint them, but wouldn't a thorough cleaning do as well? Laundry tubs are virtually impregnated with soapy residues, and preparing them for painting will take some cleaning—repeated scrubbings with a strong detergent solution. If you must paint, do a really thorough cleaning job first. Otherwise, there's no way.

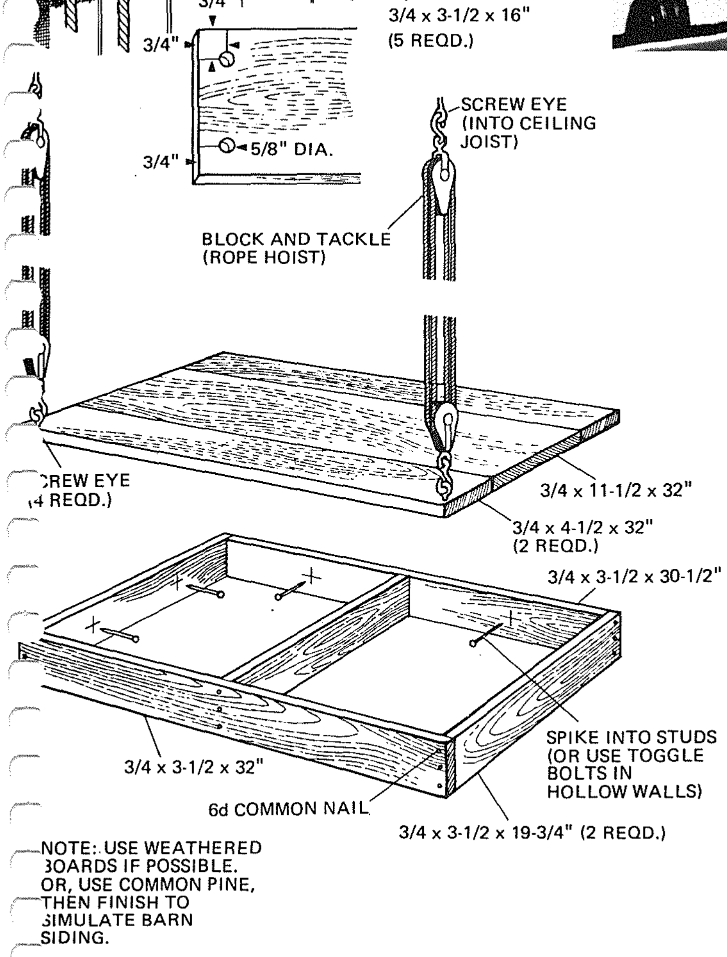
Epoxy enamel is the only finish you can expect to last under such adverse conditions, and I'd recommend the aerosol type. Wear rubber gloves when cleaning and a painter's respirator when spraying, and be sure to turn off all gas pilot lights (furnace, water heater, dryer) first.

by W. Clyde Lammey

Room with a nautical flavor

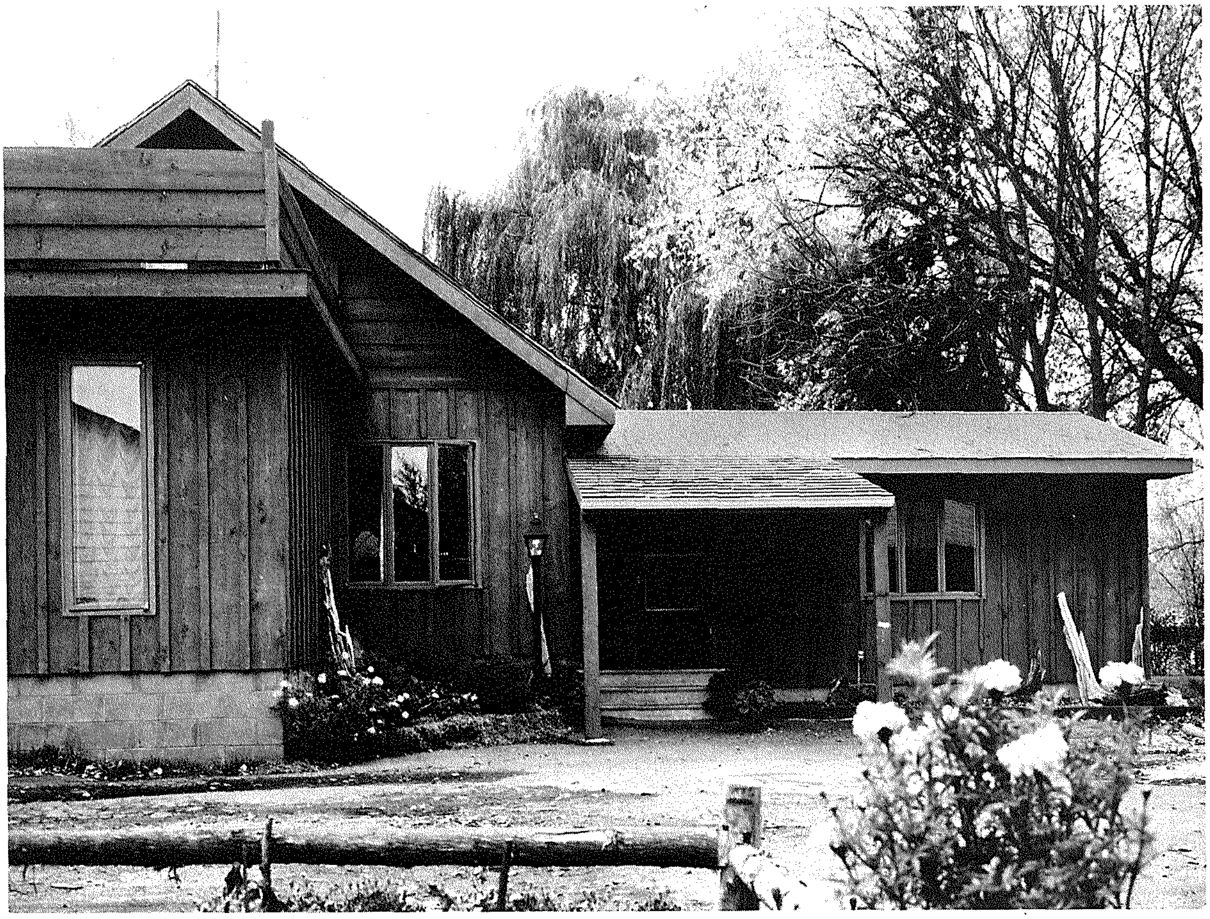

L-HOOK (INTO STUD OR USE HOLLOW-WALL ANCHOR)
1/2" NYLON ROPE
12"
3/4"
3/4"
3/4 x 3-1/2 x 16" (5 REQD.)




3/4"
5/8" DIA.
3/4"
SCREW EYE (INTO CEILING JOIST)
BLOCK AND TACKLE (ROPE HOIST)
REW EYE
4 REQD.)
3/4 x 11-1/2 x 32"
3/4 x 4-1/2 x 32" (2 REQD.)
3/4 x 3-1/2 x 30-1/2"
SPIKE INTO STUDS (OR USE TOGGLE BOLTS IN HOLLOW WALLS)
3/4 x 3-1/2 x 32"
6d COMMON NAIL
3/4 x 3-1/2 x 19-3/4" (2 REQD.)
NOTE: USE WEATHERED BOARDS IF POSSIBLE. OR, USE COMMON PINE, THEN FINISH TO SIMULATE BARN SIDING.

■ INTERIOR DESIGNERS KNOW that a home decorating scheme stands a far better chance of being successful when a basic theme is adhered to—and if elements within the room are kept relatively simple. Because both rules were followed here, this room with seagoing theme is both appealing and functional. Two panelings from the Masonite Corp. help to create the mood: Chapel White Stone applied to one end wall, and Driftwood (from the Forester series) on the remaining three walls and ceiling. Hefty, but false, rafters overhead complete the feeling of seashore and ships.

The clever room accessories, for which we've drawn plans, are at once charming and practical. To build them, you can use low-cost common pine which can be quickly made to look like driftwood. After cutting parts to size, distress the lumber by beating it with a chain. Next, sand the parts smooth and apply a latex stain. If weathered boards are available, you can use them. Finally, brush on two coats of semigloss varnish. Assemble and hang the pieces as shown, using nylon rope and hoists which are available from Sears stores and catalog outlets. *Caution:* Make certain that all hooks are well anchored in the wall and ceiling.



HANDSOME NEW exterior features rough-sawn cedar board-and-batten siding that replaced old white clapboard.

Ideas for add-on rooms

Move or remodel? That's always a tough decision. Here's a family that decided to remodel and improve their old home. It paid off for them with an easy-to-maintain exterior and a beautiful interior

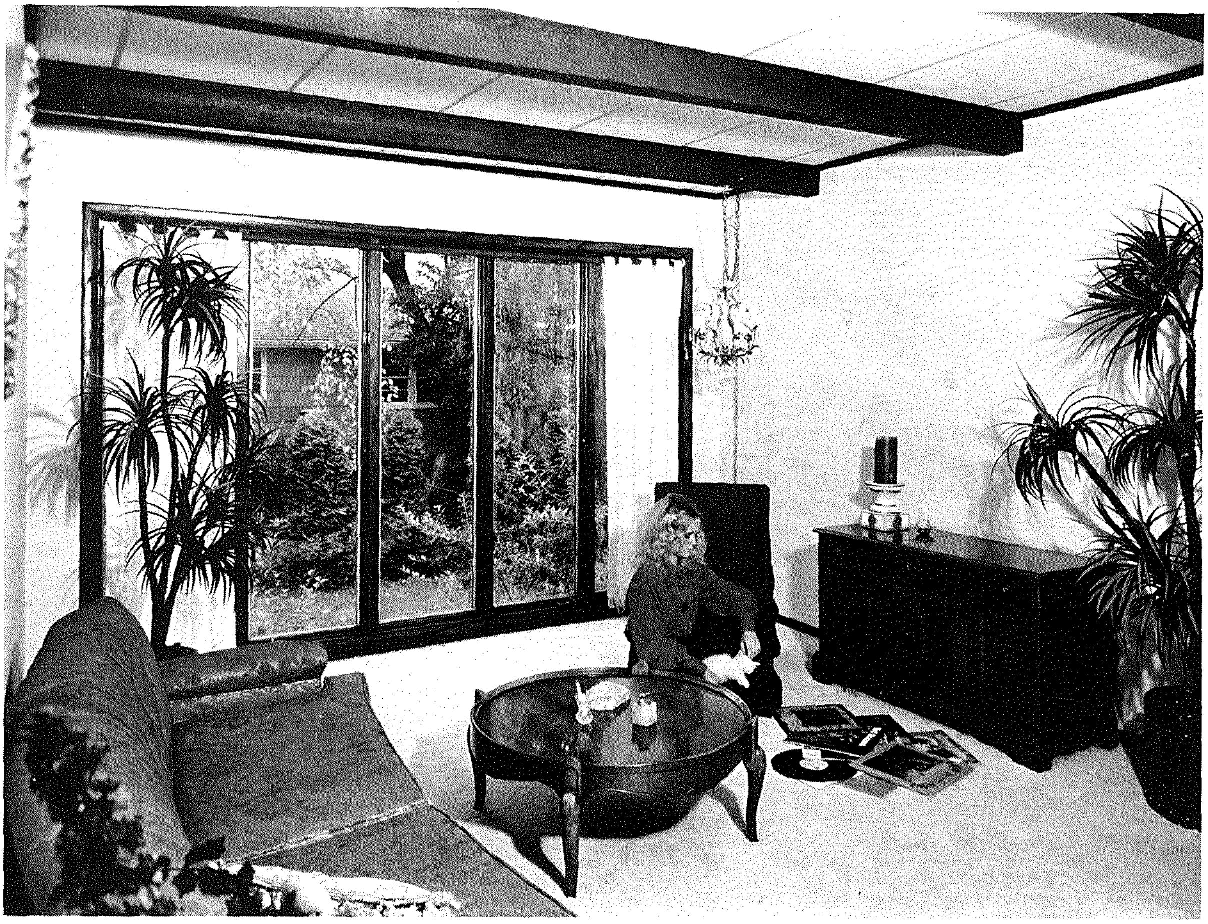
SEE ALSO

Family rooms . . . House additions . . . Kitchens . . . Measurements . . . Remodeling, exterior . . . Remodeling ideas

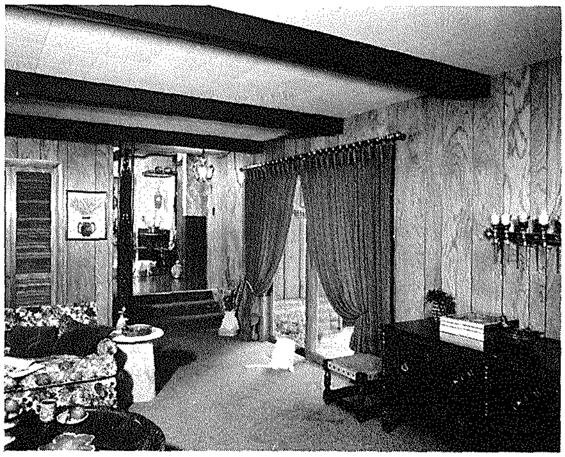
▪ WITH A GROWING family, Mr. and Mrs. Reno Damuth of Minneapolis had to make a decision: Move or improve their 75-year-old home. They chose the latter course, adding a new patio, family room and bedroom. Doing most of the work themselves, they also remodeled the interior and exterior.

The old exterior of white clapboard siding always seemed to peel and blister shortly after painting. To finish the outside, the Damuths chose rough-sawn cedar board-and-batten siding and asphalt shingle roofing.

The family room, living room and dining-kitchen area were tied together in design by installing dropped ceilings of acoustical tile ac-

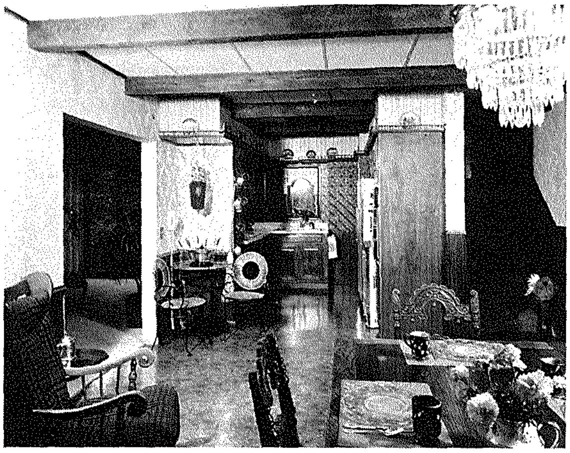


LIVING ROOM WALLS (above) were resurfaced by removing the old plaster and installing plasterboard over the studs. False ceiling beams and trim around the large expanse of window are stained to match.

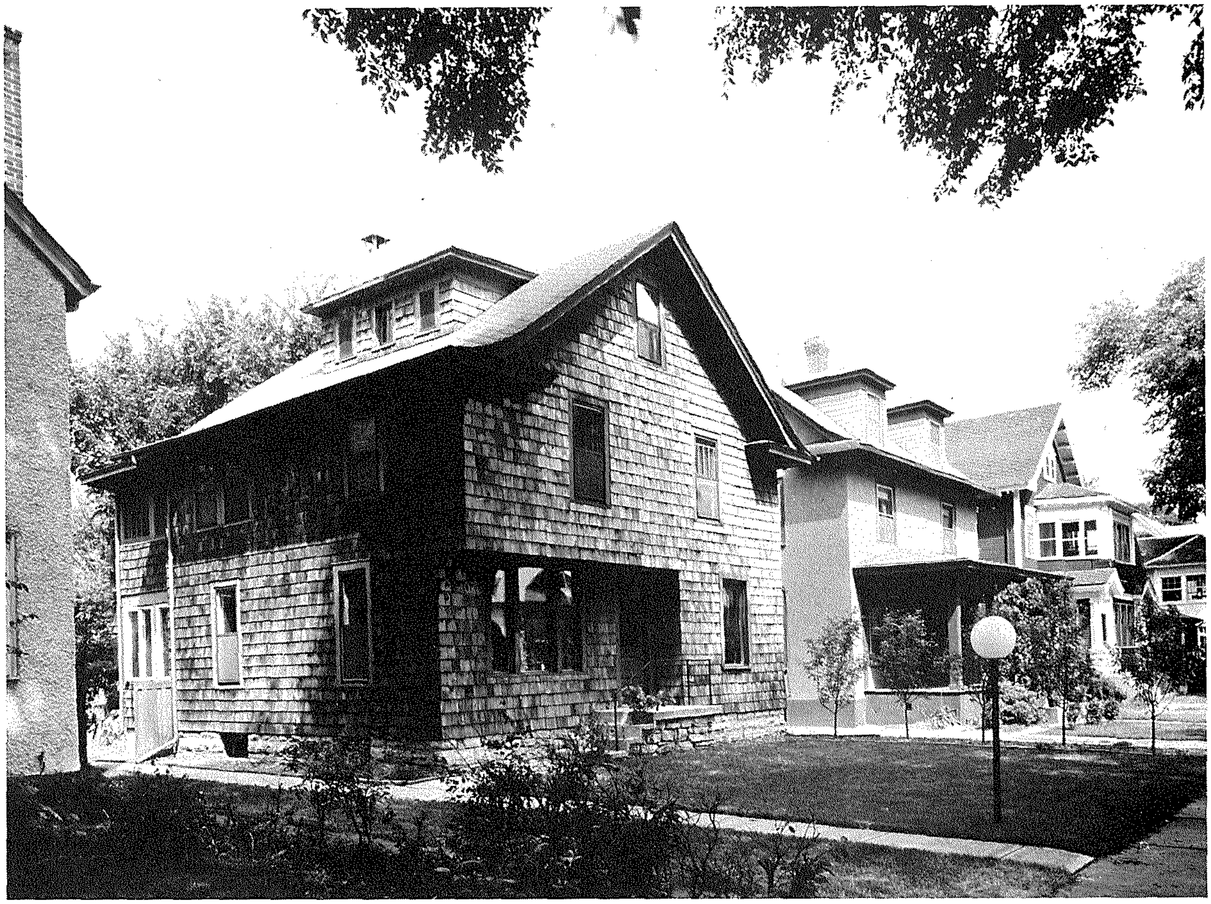


FAMILY ROOM addition (left) was built at ground level and is only three short and convenient steps from the dining-kitchen area.

KITCHEN-DINING AREA (below) was remodeled with new wallpaper, floor and ceiling tiles. The paneling and ceiling beams match the kitchen-cabinet finish.



cented with hollow (false) beams. New living-room windows were extended to floor level for maximum view. Family-room walls were covered with an antique elm paneling to give the room a warm, lived-in feeling. Sliding glass doors were installed to give handy access to the patio. A large kitchen window (over the sink) was replaced with a smaller one to gain wall cabinet space.



New life for an old house

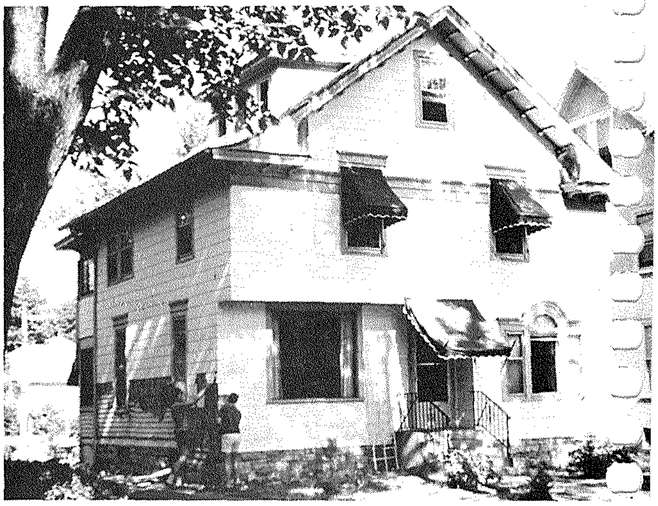
■ THE 75-YEAR-OLD Minneapolis house that architect Bob Brantingham bought bore little resemblance to his remodeled, updated home of today. It had been a dilapidated house nobody wanted, but it was a do-it-yourself challenge to the new owner.

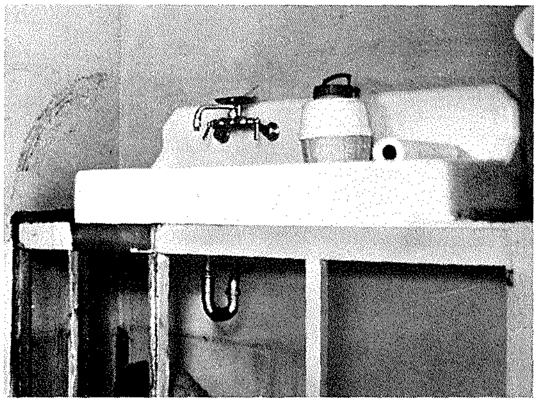
An amateur carpenter, Brantingham first replaced the white asbestos shingles with cedar shakes which were stained. Next came the interior: Old-fashioned plumbing fixtures in bath and kitchen were replaced. Mahogany-colored pine woodwork that gave almost all other rooms a dark and dated atmosphere was, with the walls, painted a stark white and splashes of color provided by paintings, sculpture and furniture. Result: The nineteenth century interior is now totally contemporary.

SEE ALSO

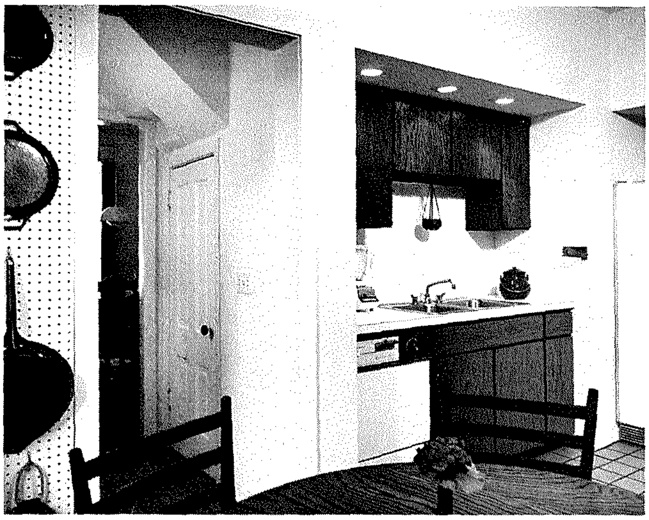
Garage remodeling . . . House additions . . .
Kitchens . . . Painting, interior . . .
Remodeling, exterior . . . Remodeling ideas . . .
Spiral stairs

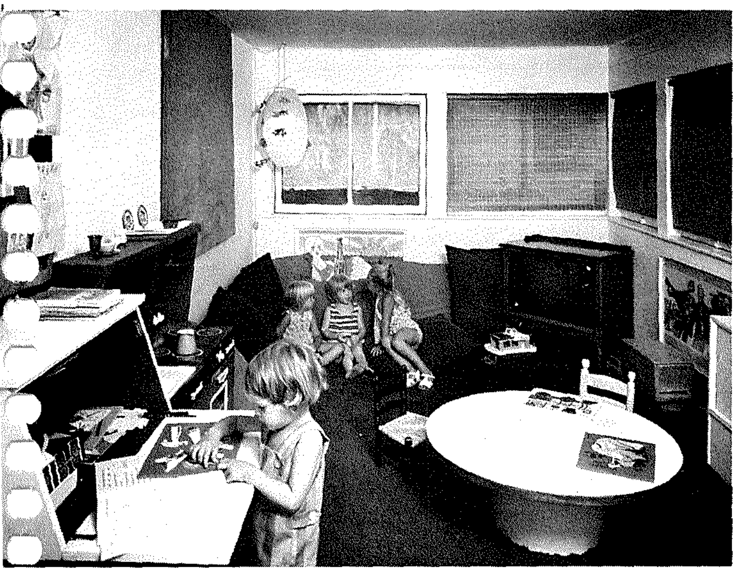
EXTERIOR OF 75-year-old home was rejuvenated by replacing old white asbestos shingles with stained color shakes.

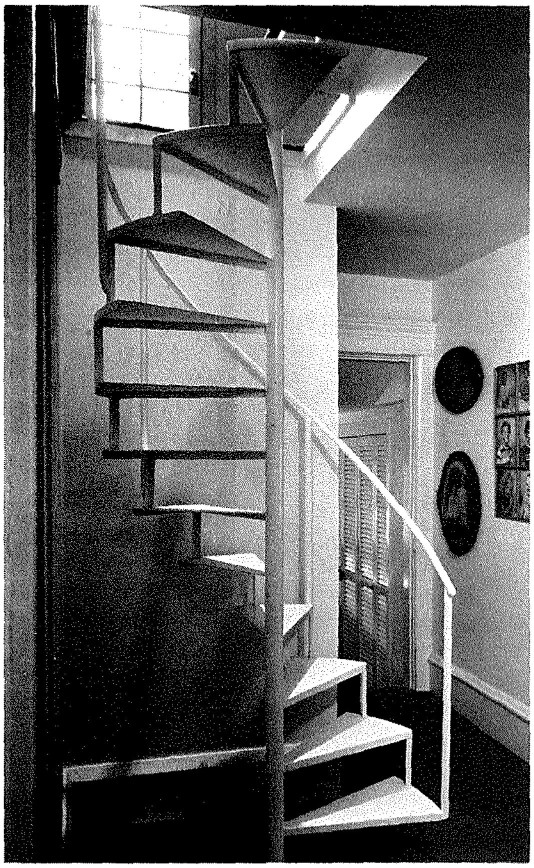


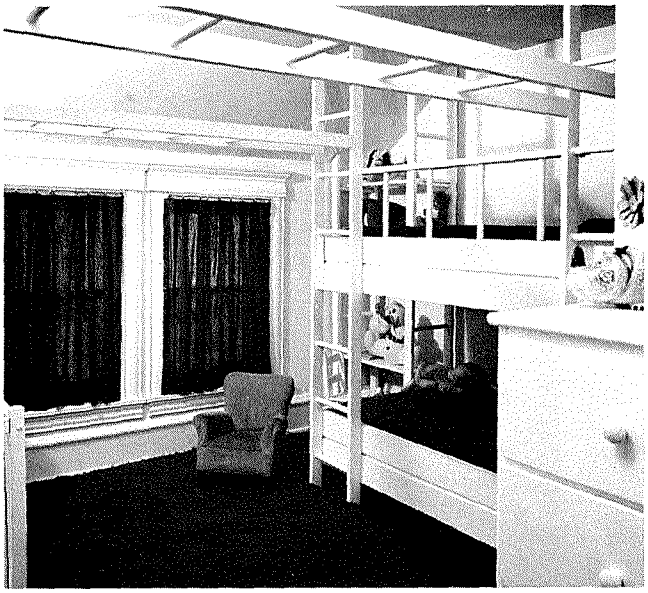


KITCHEN WAS modernized after old sink and its open framing (above) were removed. New kitchen (right) has plenty of cabinet space, good ventilation and recessed lighting over double sink.

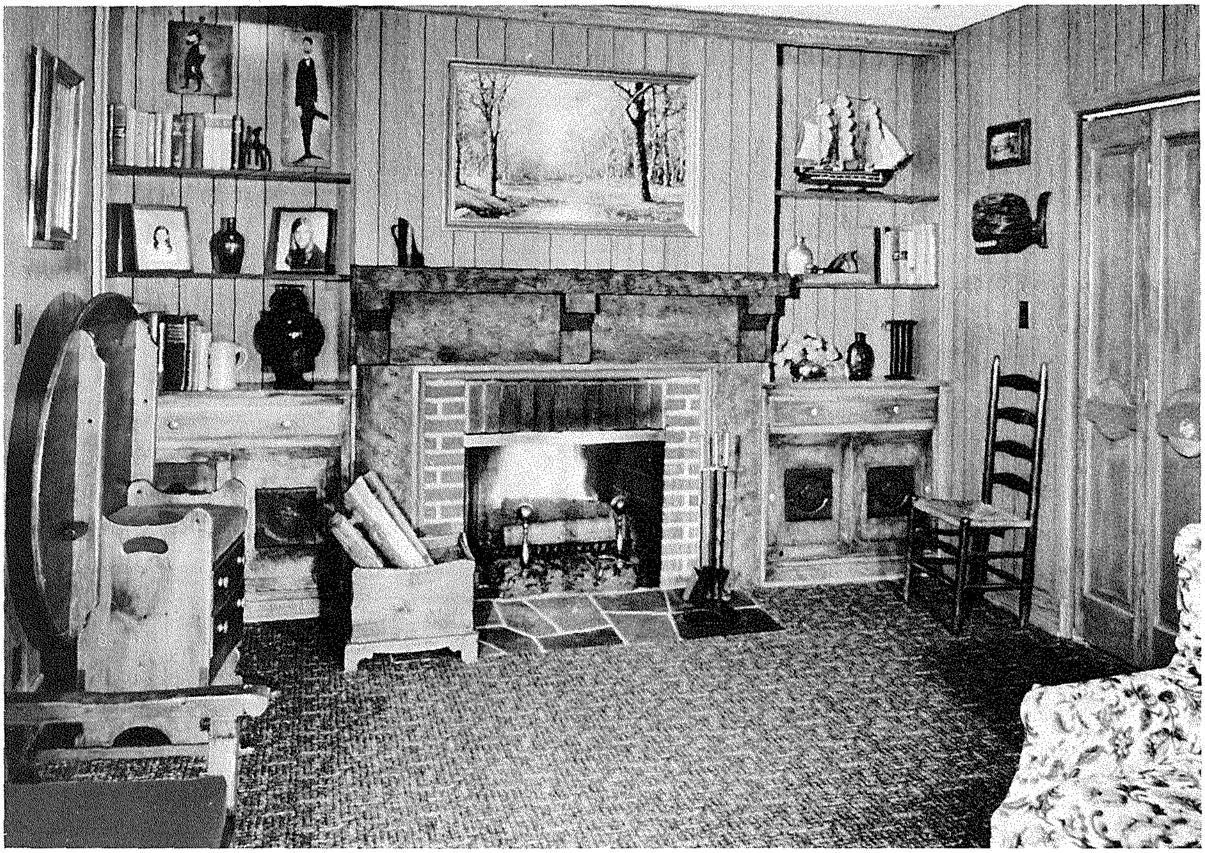








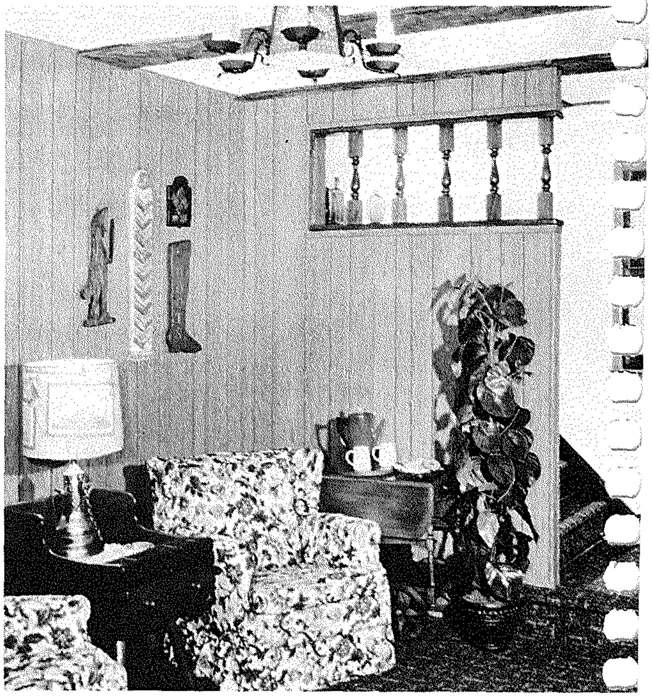
SPACIOUS, well lighted playroom (center, left) was made by enclosing the porch on the second floor. A spiral stairway opened up third-floor attic, was installed for the delight of the children as well as its good looks and practicality. Children's bedroom (left) also became a play area with the imaginative use of extension ladders.



FIREPLACE was left intact but framed and skinned with paneling. Protruding screen was replaced with recessed one.

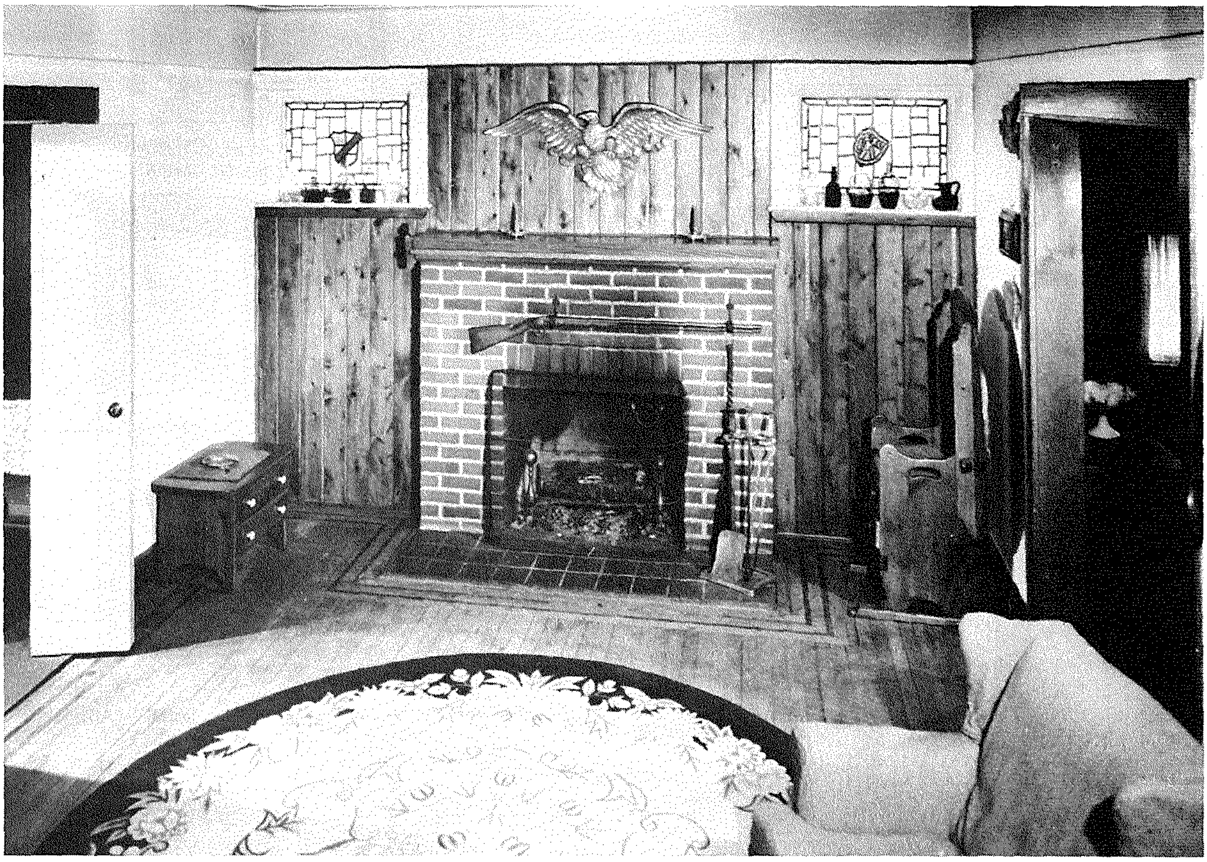
How to update an old living room

NEW STAIRWALL and white Marblestone paneling on outside wall make renovated room appear larger.

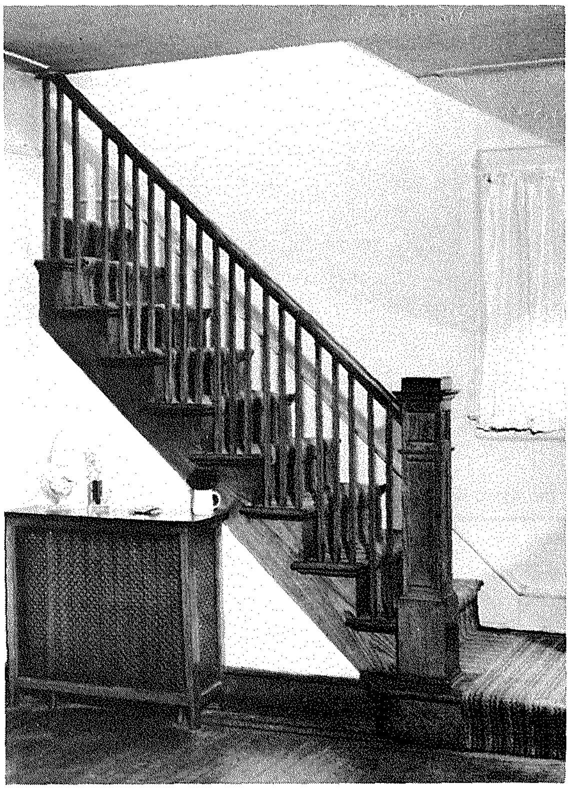


SEE ALSO

Bookcases . . . Ceilings . . . Fireplaces . . . Paneling, hardboard . . . Paneling, plywood . . . Paneling, wood . . . Shelves

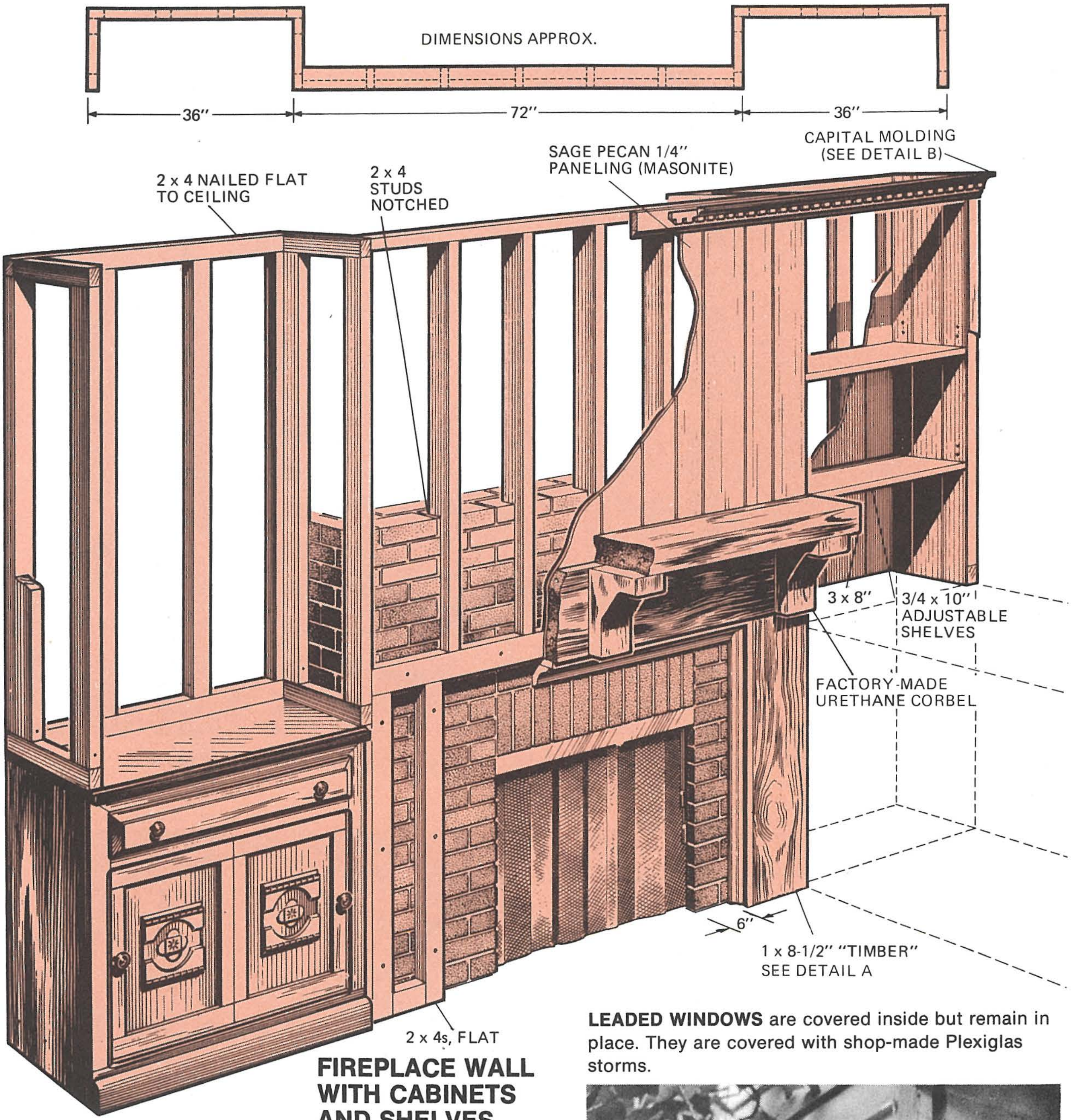


"BEFORE" PHOTOS of fireplace and stair walls show dramatic difference remodeling made in this room.



▨ HAPPILY, HOME-IMPROVEMENT materials offered today make it easy to create a warm living room such as the one shown at the top of the opposite page. As can be seen in the "before" photos above and on the right, the major faults in the original room are those that you would expect to find in most 50-year-old living rooms: an oversized fireplace with leaded glass windows flanking it, plaster cove where walls and ceiling meet and an open, unimaginative stairway leading to the second floor. These were the problems that Harry Wicks faced when he decided to remodel the room shown.

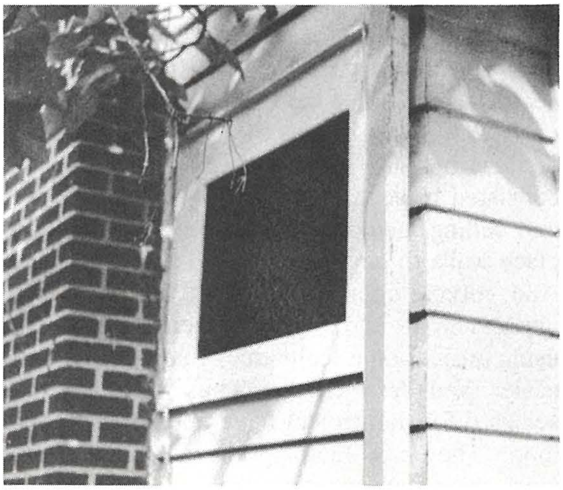
No changes were structural. A quick rundown of the transition reveals, in fact, that the job consisted basically of covering the floor, walls and ceiling, and redesigning the stair and fireplace walls to be more pleasing and functional. And, relying upon his experience in the home-improvement field, Wicks solved the problems using professional techniques that make the job easier and less costly. Thus the materials selected for the project have one thing in common: They are factory-finished to eliminate work steps beyond carpentry.

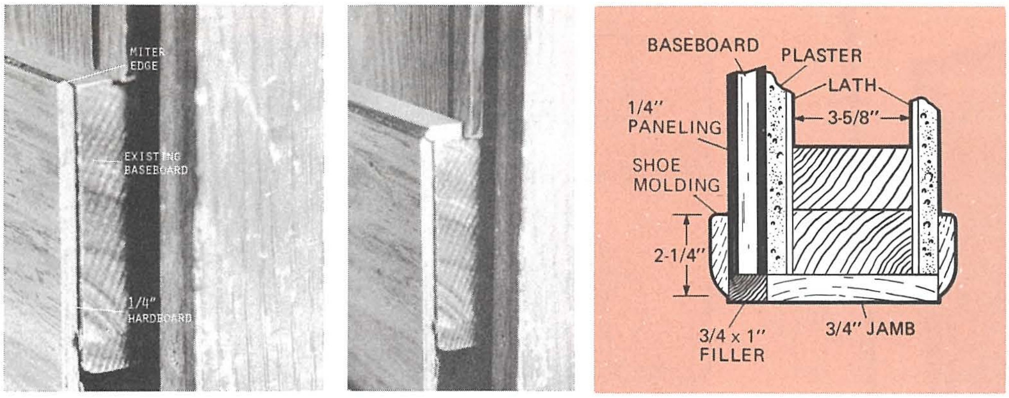

DIMENSIONS APPROX.
36"
72"
36"
2 x 4 NAILED FLAT TO CEILING
2 x 4 STUDS NOTCHED
SAGE PECAN 1/4" PANELING (MASONITE)
CAPITAL MOLDING (SEE DETAIL B)
3 x 8"
3/4 x 10" ADJUSTABLE SHELVES
FACTORY-MADE URETHANE CORBEL
6"
1 x 8-1/2" "TIMBER" SEE DETAIL A
2 x 4s, FLAT

FIREPLACE WALL WITH CABINETS AND SHELVES

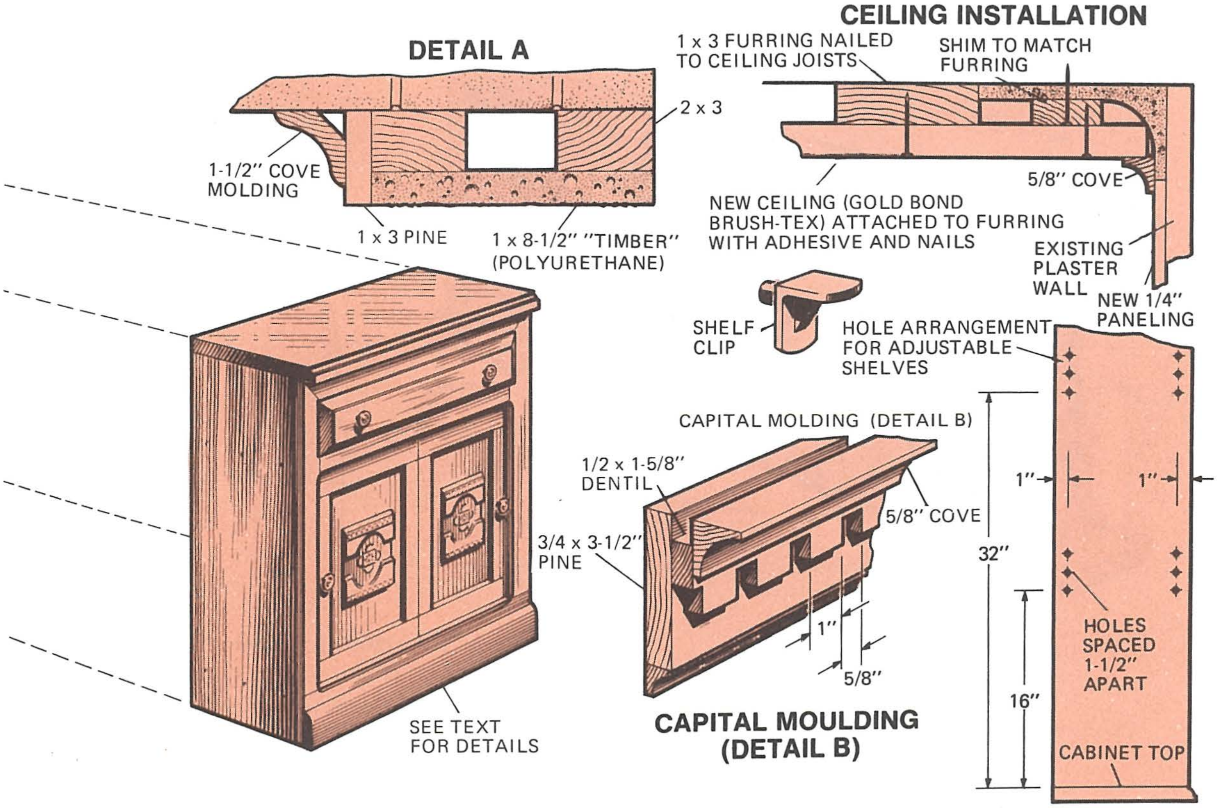
updating living room, continued

LEADED WINDOWS are covered inside but remain in place. They are covered with shop-made Plexiglas storms.





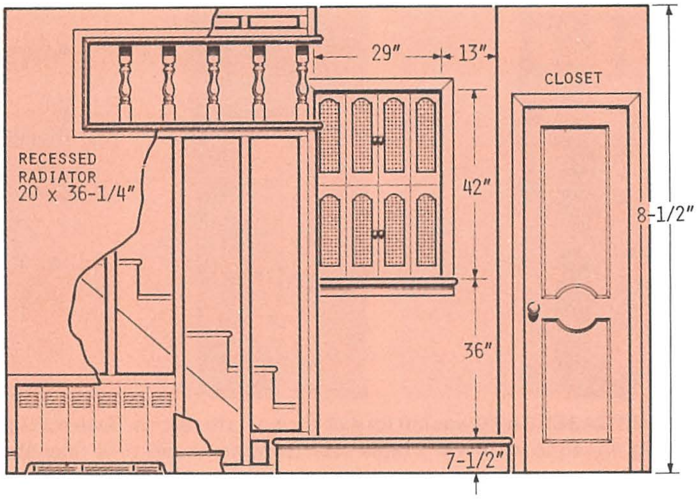
EXISTING BASEBOARD was left for 4x8-ft. panels to rest on. Base was then concealed with strips of the paneling ripped to width on a table saw. Drawing shows pine filler-strip added to existing jamb.

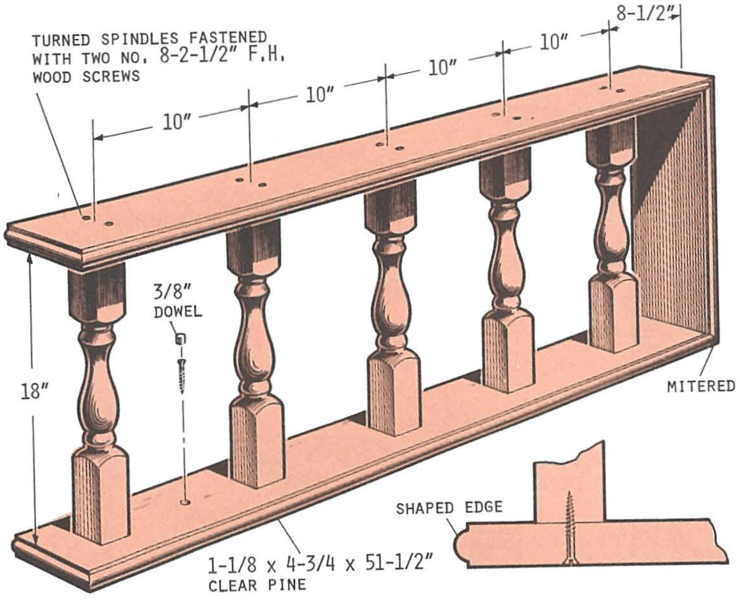

DETAIL A
2 x 3
1-1/2" COVE MOLDING
1 x 3 PINE
1 x 8-1/2" "TIMBER" (POLYURETHANE)
CEILING INSTALLATION
1 x 3 FURRING NAILED TO CEILING JOISTS
SHIM TO MATCH FURRING
5/8" COVE
NEW CEILING (GOLD BOND BRUSH-TEX) ATTACHED TO FURRING WITH ADHESIVE AND NAILS
EXISTING PLASTER WALL
NEW 1/4" PANELING
SHELF CLIP
HOLE ARRANGEMENT FOR ADJUSTABLE SHELVES
CAPITAL MOLDING (DETAIL B)
1/2 x 1-5/8" DENTIL
5/8" COVE
3/4 x 3-1/2" PINE
1"
5/8"
1"
1"
32"
16"
HOLES SPACED 1-1/2" APART
CABINET TOP
SEE TEXT FOR DETAILS
CAPITAL MOULDING (DETAIL B)

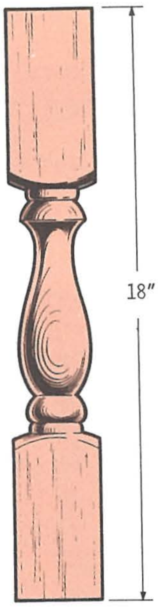
Walls. Since the existing plaster walls were in good shape—sound and with no cracks—they were simply covered with Masonite Pecan Royalcote using panel adhesive and plenty of nails. To make the job easier, vinyl-clad molding was used throughout. Because the room is 8½ ft. high, existing baseboard was also left in place and the sheets of paneling rest on it. The old base was then covered with strips of paneling ripped from waste (door and window cutouts). The existing entry, closet and bi-fold doors were hung to complement the room. The only other wall treatment required was to replace an archaic door chime.

Ceiling. Two solid reasons made covering the ceiling a better solution than trying to patch what existed. The first was the dated, plaster cove and picture molding that surrounded the room. Perhaps more important, was to finally get rid of the calcimine-coated headache that *no* paint seemed to adhere to. The product chosen was Gold Bond's Brush Tex. Available in 4x14-ft.

STREAMLINED light switch by Slater Electric, Glen Cove, NY. It is sold by most electrical supply houses.



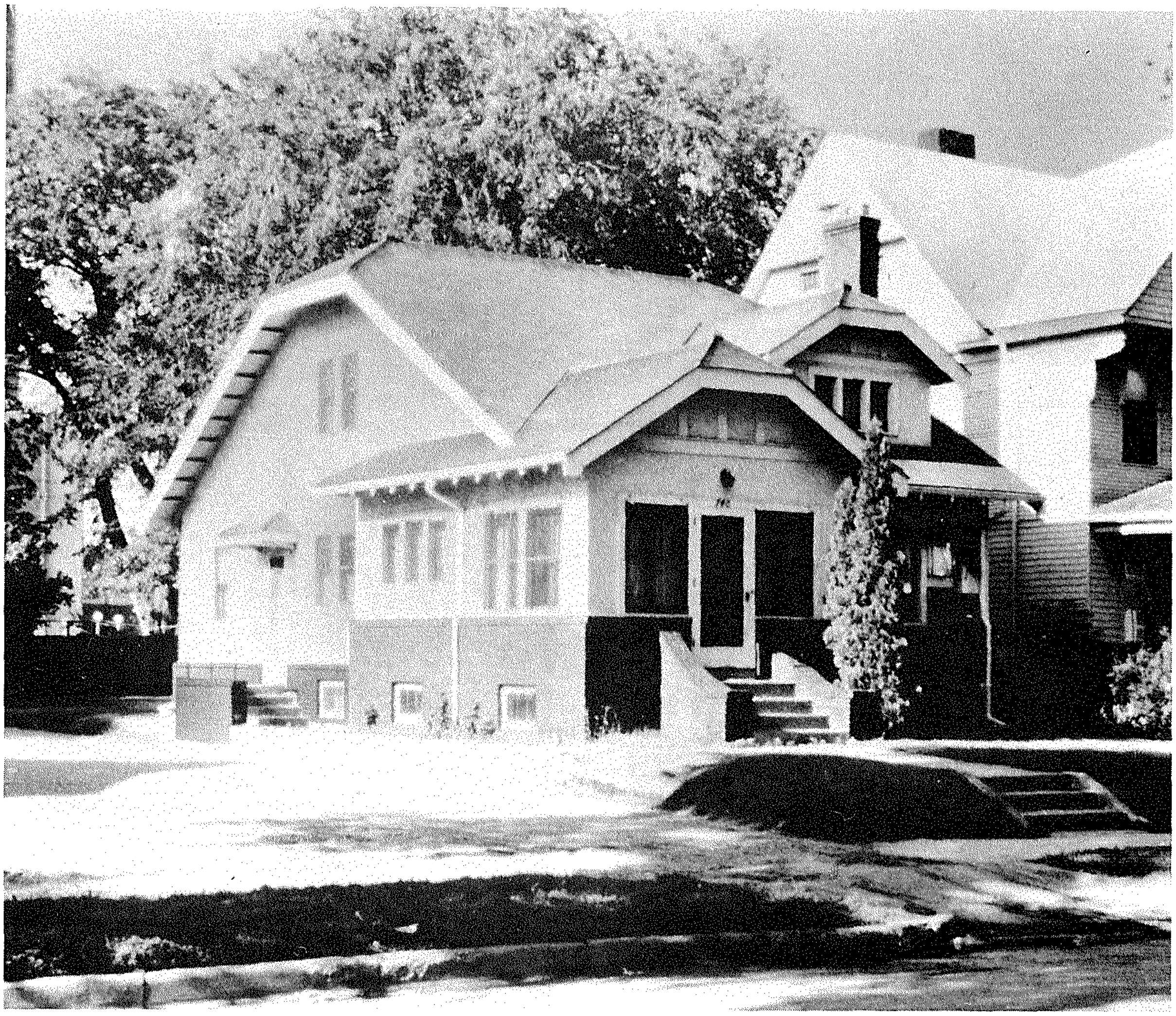

TURNED SPINDLES FASTENED WITH TWO NO. 8-2-1/2" F.H. WOOD SCREWS
10"
10"
10"
10"
8-1/2"
3/8" DOWEL
18"
MITERED
SHAPED EDGE
1-1/8 x 4-3/4 x 51-1/2" CLEAR PINE



updating living room, continued

sheets, it is heavily textured so even if you miss a nailhead and give it a blow with your hammer, it is easily fixed. Urethane beams and a handsome early American electrical fixture completed work on the ceiling.

New walls. The fireplace wall was framed out to receive two cabinets. Then, leaving windows in place, the entire wall was skinned with paneling. The shelves on this wall are stained pieces of plywood and the edges are covered with plastic shelf edge. Two high-hat eyeball lights on an independent switch are aimed at this wall to give sufficient light. The stairwall transformation had a big impact on the appearance of the room because it makes it seem larger. The white paneling on the outside wall is what opens it up visually. To finish, Ozite carpeting went down, wall-to-wall, to hide the old oak floor.



CALIFORNIA-BUNGALOW-STYLE house, typical of those found all across America, before exterior and interior were completely remodeled. To see the transformation, turn the page.

New look for an old house

It is hard to recognize this as the same house after the total exterior decorating that was done. By changing the roof line and windows and adding a balcony the house above took on a charming new appearance

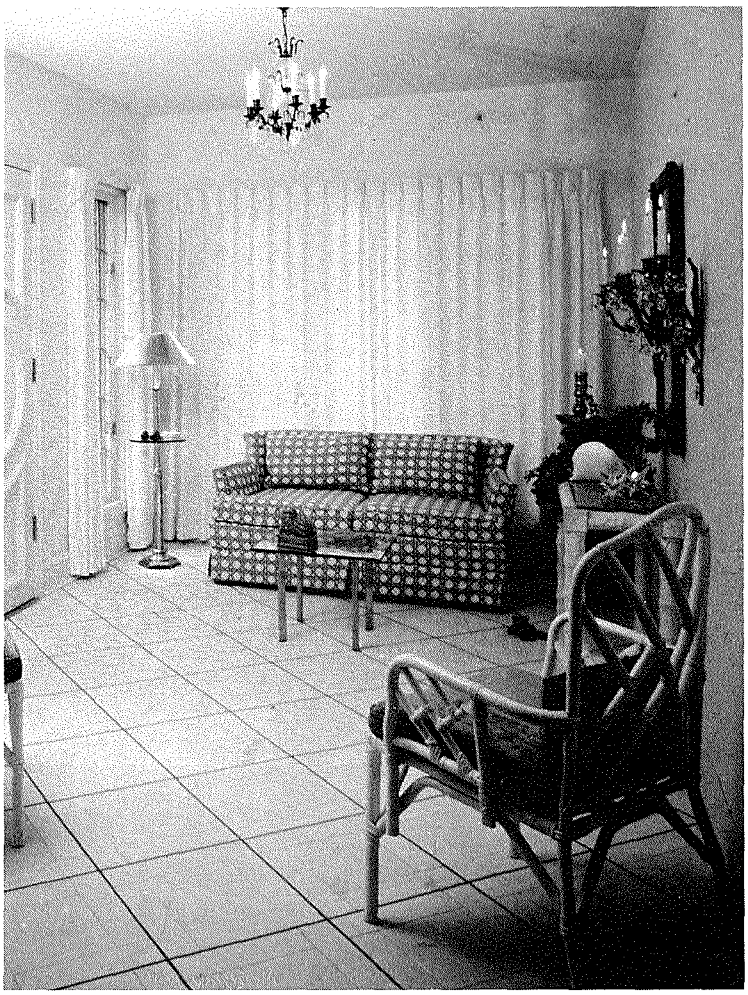
■ THOUGH MUCH has been written about interior decorating, considerably less has been written about *exterior* decorating. Yet the outside of your home is what most people—friends, neighbors, relatives—see most often.

For Mary Goff of Minneapolis, this consideration was of primary importance when she decided to remodel her home after it had been moved from a deteriorating neighborhood to a new site on a street lined with attractive residences.

The hot-water furnace was left behind and a forced-air heating system installed. The natural outgrowth then was to add central airconditioning; it was more economical and efficient than

SEE ALSO

Entryways . . . Home improvement . . . Remodeling . . . Remodeling ideas . . . Roofs . . . Siding . . . Windows

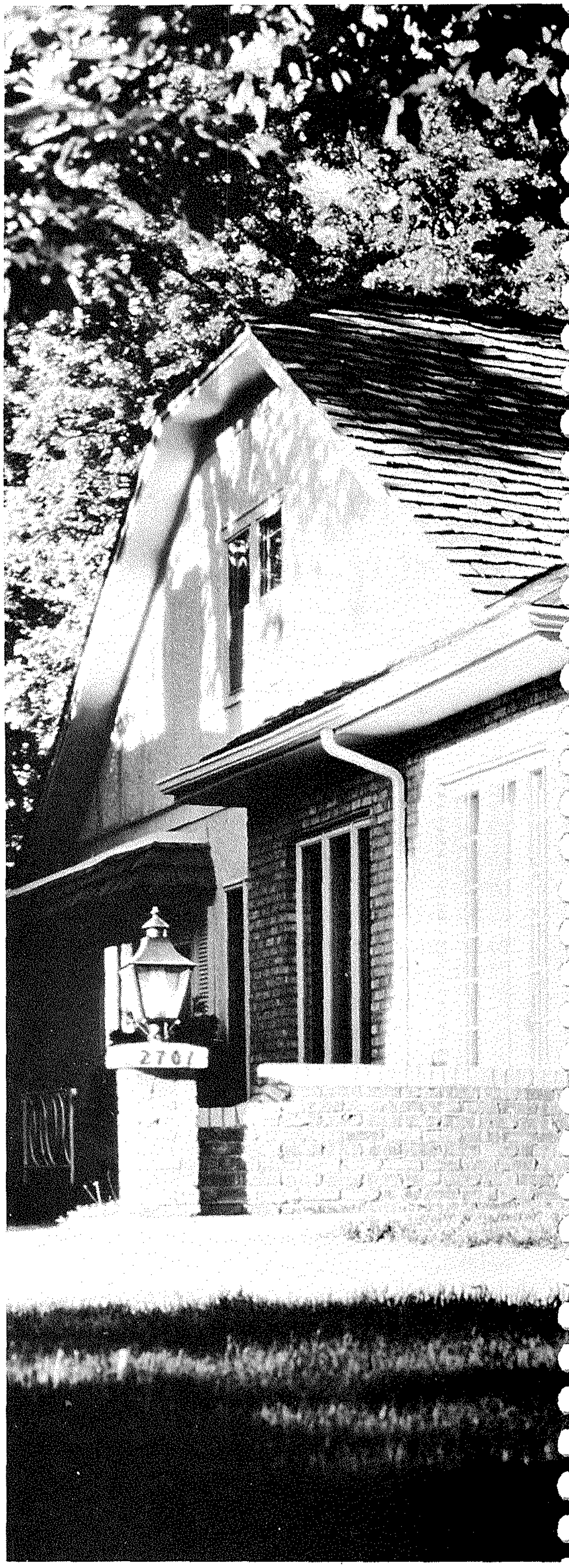


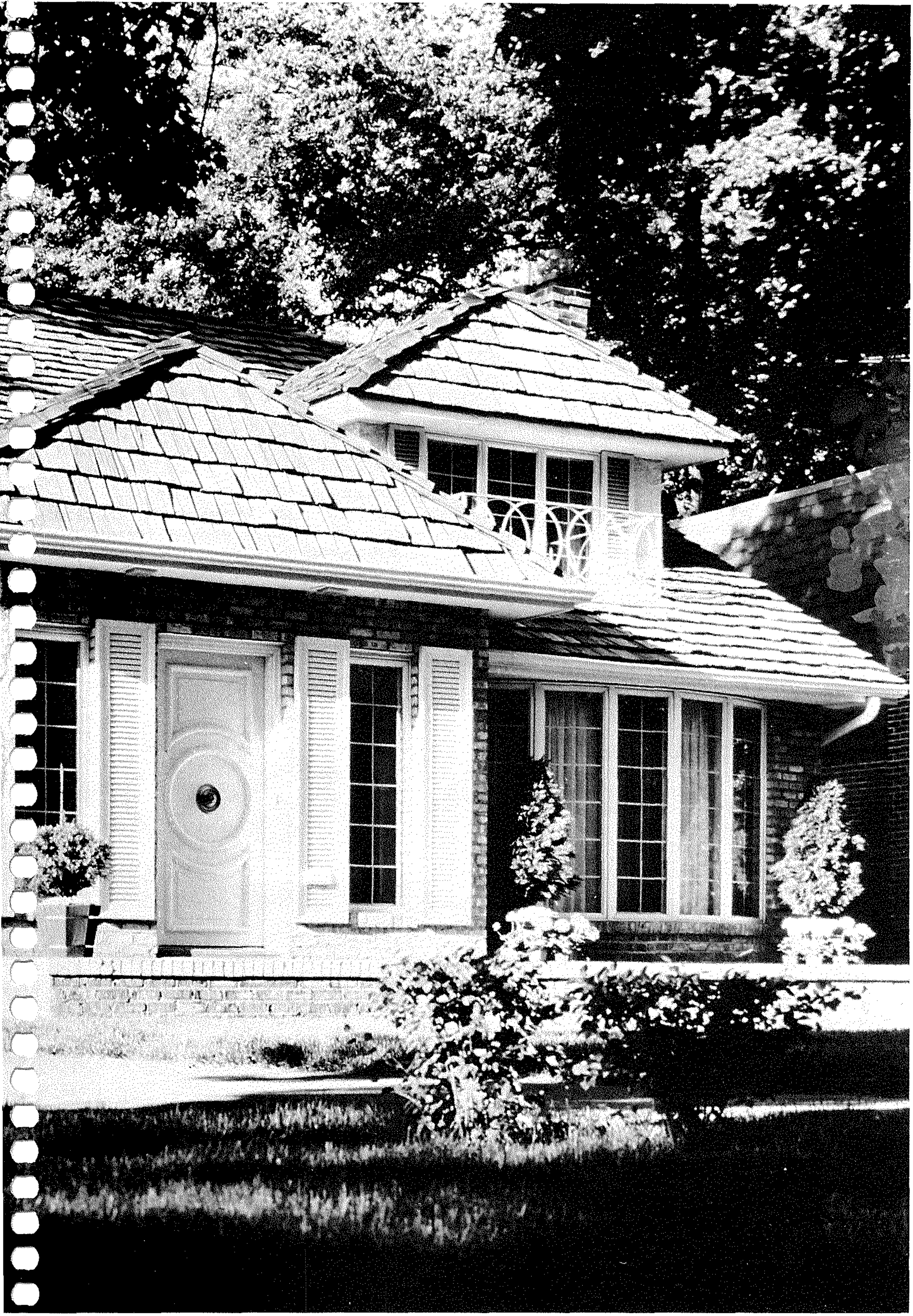
ATTRACTIVE foyer-sitting room (above) is a good indication of the thorough remodeling and redecorating job done throughout remainder of the house. Front wall of the home was extended six feet and a bay window added. White floor tiles, walls, woodwork, ceiling and furniture make spacious area appear even more open.

window units and it would not ruin the planned exterior style.

Exterior decorating started with the roof. Because this was the largest unbroken surface and might well last 25 years, shingle quality, style and color were chosen with care.

The roof line was altered in front, a dormer enlarged and hand-split cedar shakes applied to the roof. A wrought-iron balcony was added in front of the dormer, double-hung windows removed and casement windows installed. After a new bay-window section was completed in front, used-brick veneer was applied, and a front terrace also faced with brick. White shutters were used on the balcony and entry windows, and the circular design on the wrought-iron balcony effectively repeated on the front door.





Facelifting—cheapest way to get a 'new' home

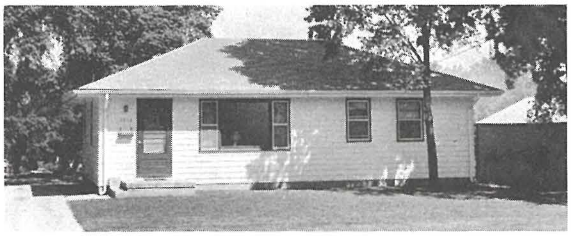
Instead of simply repainting your home, take a look at some of these ideas to give your house a striking new look. With imagination on your part, your old home can become a new one

■ IF YOUR HOME is due for repainting, step back and take a long, hard look at it, then decide whether a paint job alone will give you the look you really want. Chances are the house, as well as its shrubbery, can stand some "pruning." Ornate but useless gingerbread and hardware can be removed, for example. In some cases removal of an "improvement" (something a former owner made that you probably wouldn't have) will restore the house to its original architectural concept—resulting in aesthetic improvement. And older homes will nearly always benefit by grading and landscaping that brings them visually closer to the ground.

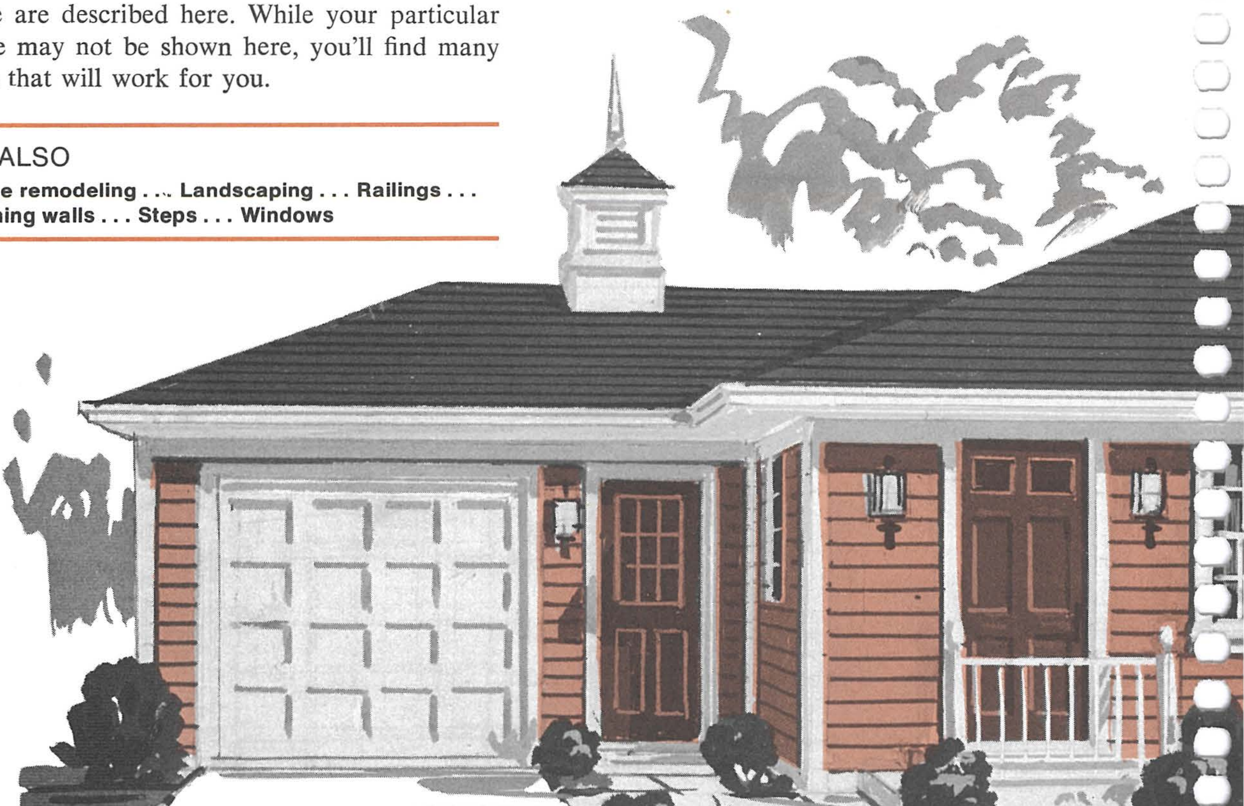
Several such low-cost ways to update your home are described here. While your particular house may not be shown here, you'll find many ideas that will work for you.

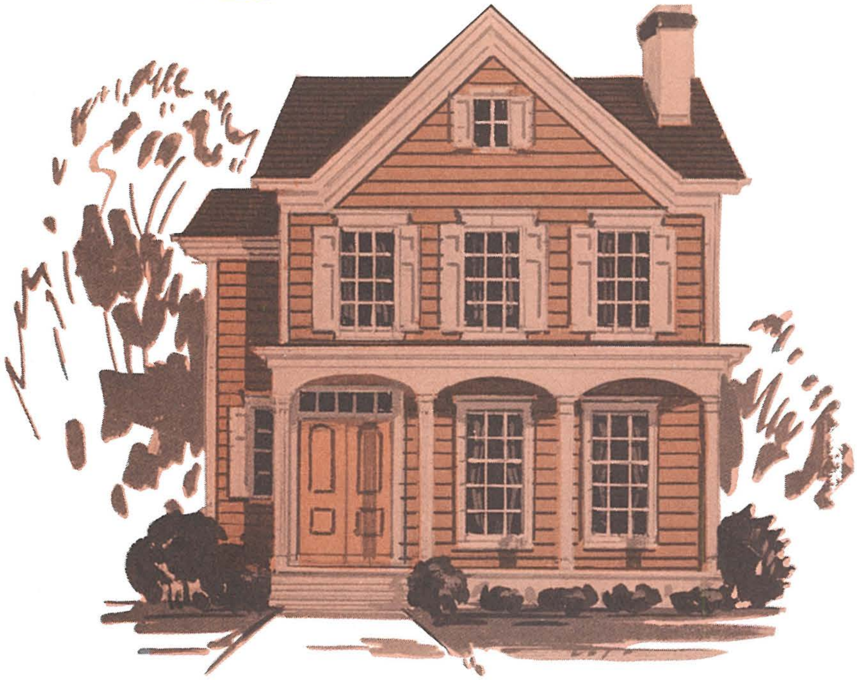
SEE ALSO

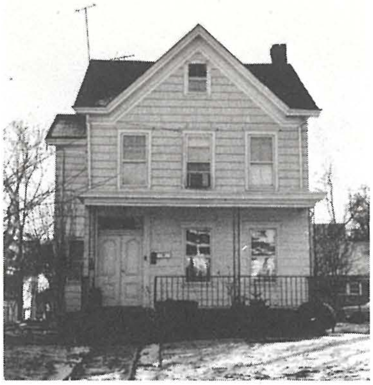
Garage remodeling . . . Landscaping . . . Railings . . . Retaining walls . . . Steps . . . Windows



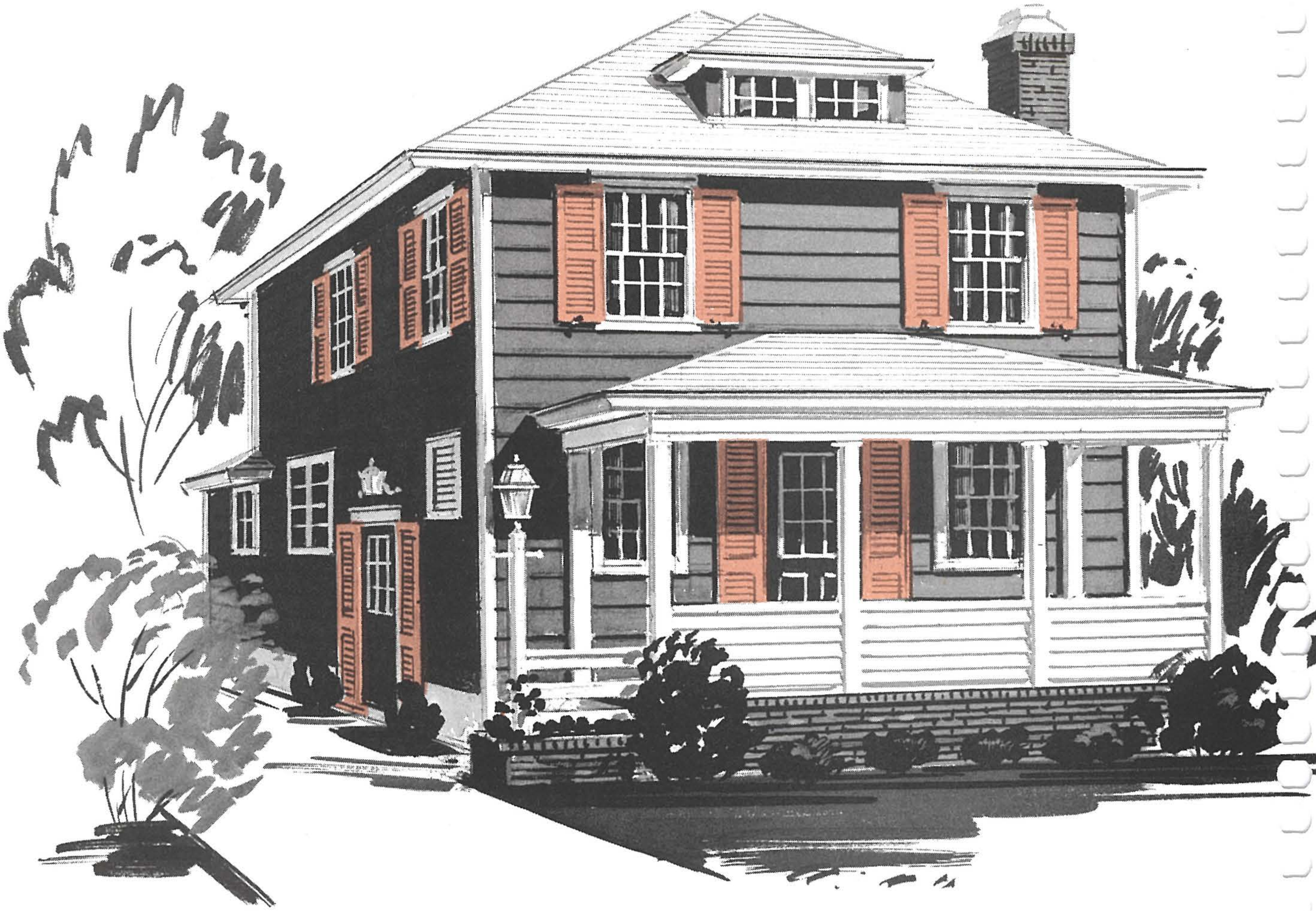
CHARM AND VALUE are added to this tract-type single-level dwelling, typical of the most economical homes to be built today. The simple design lends itself to easy, inexpensive improvement. Note how the colonial touches—windows, shutters, plants, and lamps—add charm. The garage extension lengthens and adds to the convenience and value of the home.



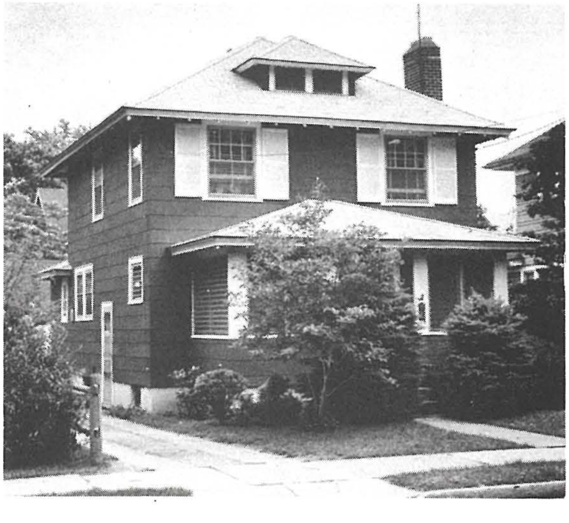




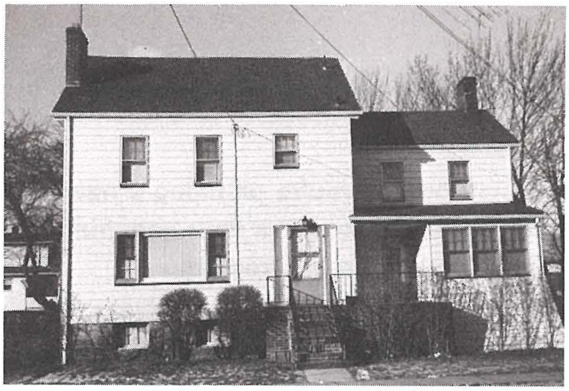
RESTORE true character to a roomy, two-story frame home with little more than careful selection of color and the removal of some "improvements" that violated the building's original character. Here, removing a wrought-iron rail and adding carriage-house-style fascia restores the balance and importance of the first floor.

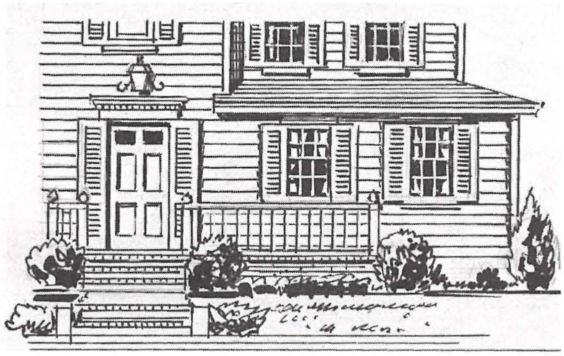


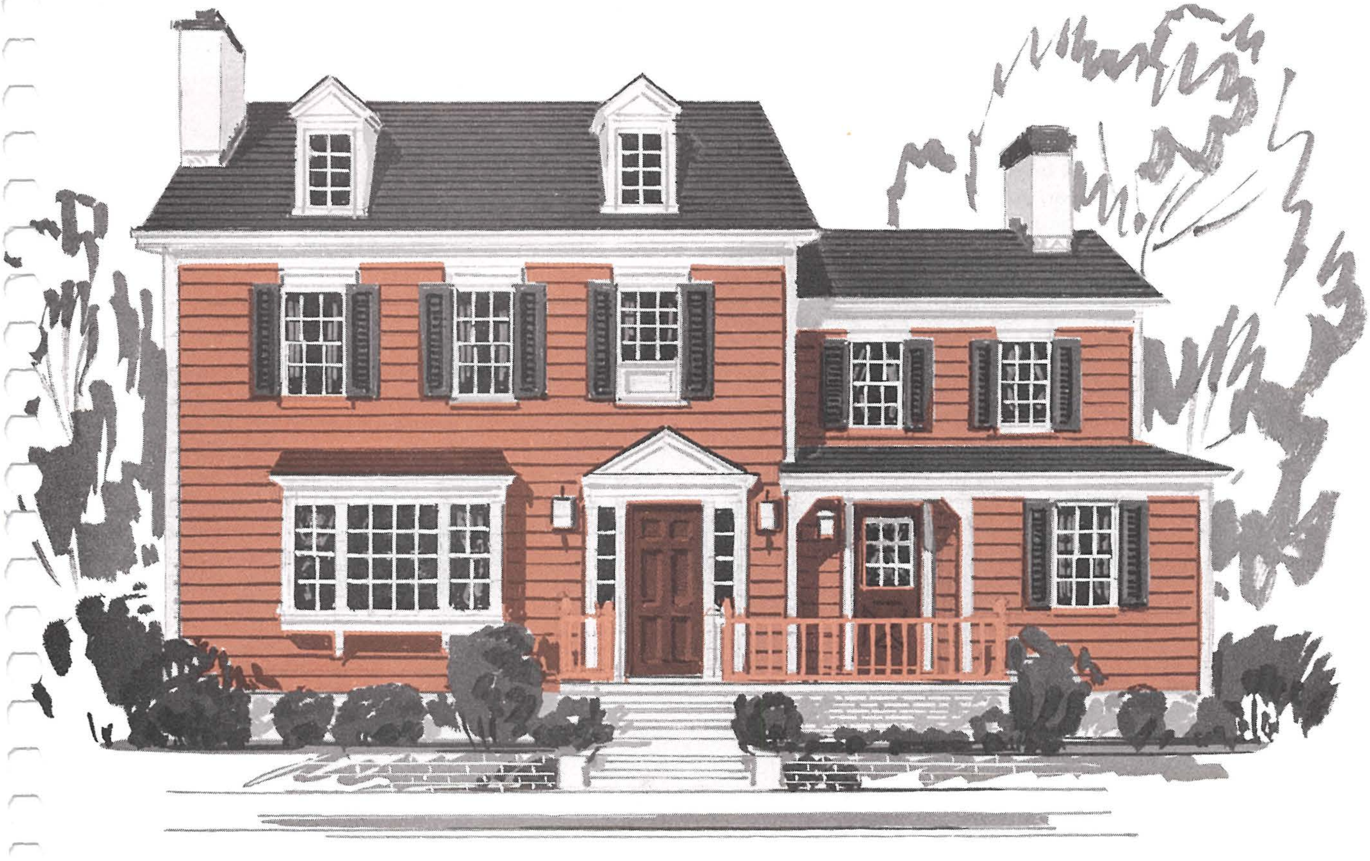
CHANGE FOR THE BETTER here amounts principally to relocation of the porch steps for better access to and from the driveway. Moving them eliminates the need for a front walk that divides the house down the middle. The clean, unbroken lines of the new porch give the facade better proportions and the house an improved overall appearance. Removing the overgrown bushes and replacing them with the low-profile plantings lets the new front show to advantage. If the upkeep of a porch that is glass enclosed doesn't pay off in well used living space, consider a change that will simplify the maintenance and improve the general looks.



A CHANGE IN GRADE can make the major difference. The good features of this house are all but lost in its height. To bring it down to earth, a retaining wall is added parallel to the sidewalk. The yard is then filled and landscaped to conceal the foundation. A colonial-style entry, new windows (note the special treatment of bathroom window above the entry), plus the addition of dormers, shutters and coordinated coach lights adds up to a rather ambitious remodeling job. But it all combines to reveal the house's true potential. If your home has a roofed niche, as shown at the top, it can be left as is or enclosed (sketch at right) for additional space.

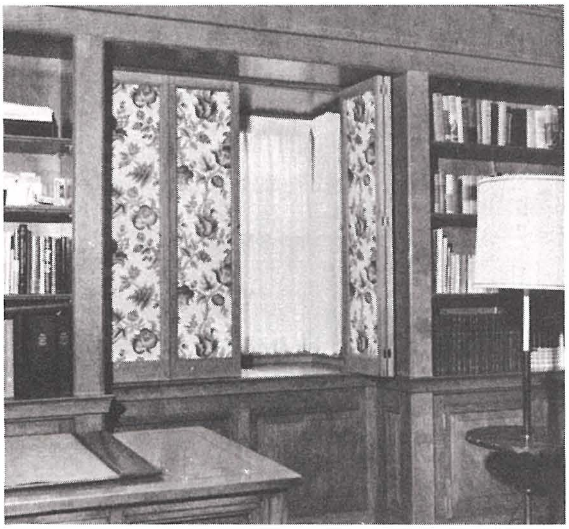




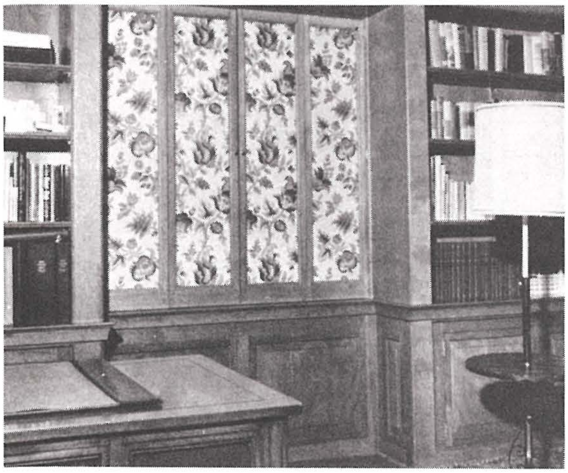


Great remodeling ideas

Whether you're planning a new home or fixing up an old one, here is a collection of ideas to spark your imagination. Some should be perfect for your home. All are easy do-it-yourself projects

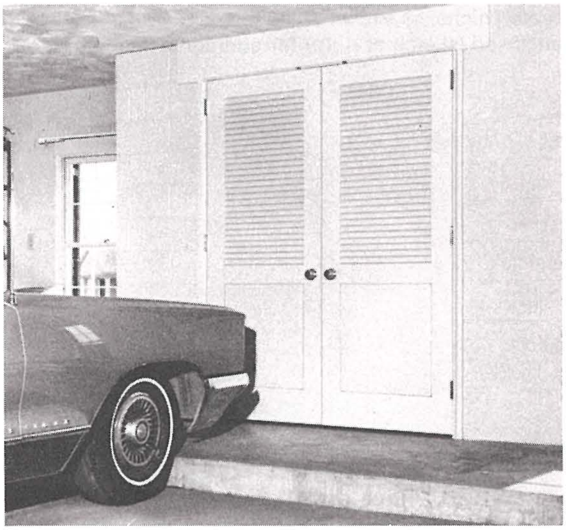


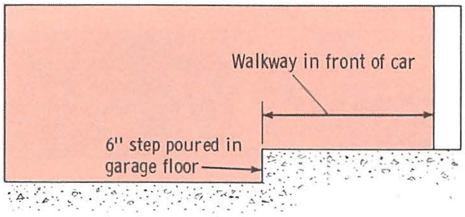
WHEN A DEEP BAY presents a drapery problem, a clever departure from common louvered shutters is to fit the window with four equal-size frames and cover them with matching drapery material. Colorful panels tie in beautifully with companion drapes. Hinged to fold like bifold doors, they fold back wide when full daylight is desired. The frames can be made from molding obtainable at your lumber yard. Just add hinges and knobs.



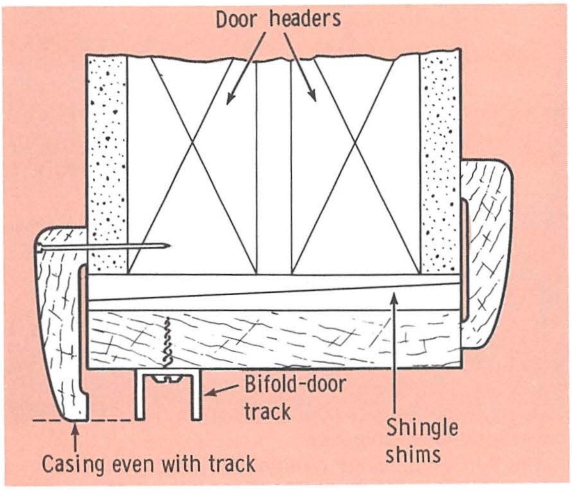
SEE ALSO

Bathrooms . . . Closets . . . Doors . . . Entryways . . . Garage remodeling . . . Magazine holders . . . Moldings . . . Room dividers . . . Storage walls . . . Windows

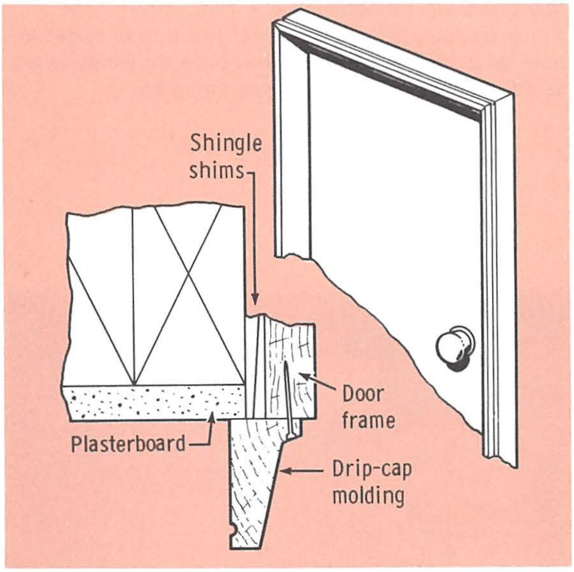




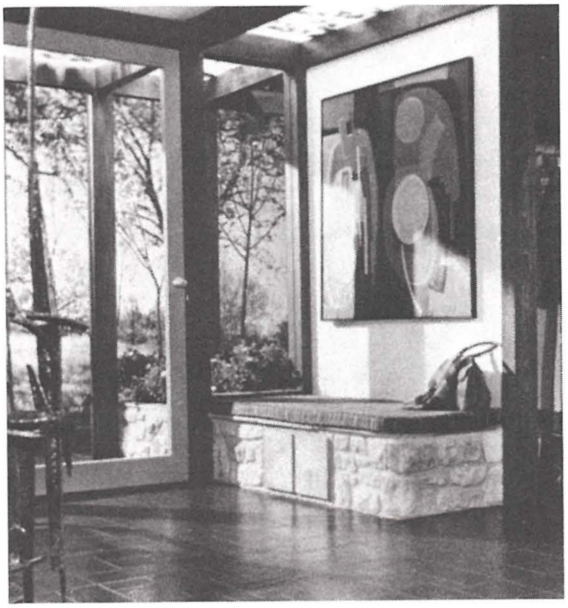
YOU (AND OTHER FAMILY DRIVERS) will have no fear of pushing out the end of the garage should you sail in too fast some night if a wide step is formed in the floor at the time it is poured. Affording a safe, solid bumper for the front wheels, the wide step also provides a convenient walkway in front of the car, eliminating the nuisance of having to squeeze around it, front or back. A louvered step-to-ceiling closet centered in the end of the garage provides out-of-sight storage for tools, paints and kid's toys.



REQUIRING NO MORE WORK than applying a casing around any door, this stunt for concealing the track of bifold doors is one that's applicable to both new construction and remodeling. As the sketch shows, it's simply a case of applying the top casing so it's even with the bottom edge of the track. Corners of the trim are mitered in the normal way but the side members are shortened. Nailing is limited to the edge of the casing. If you wish, a thin shim can be inserted in the cavity in the back of the top casing to also permit nailing into the frame header.

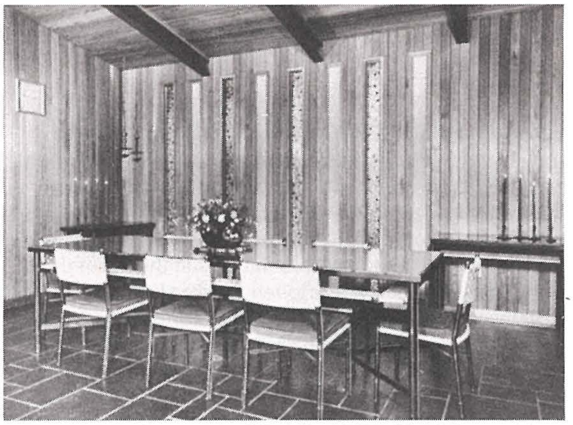


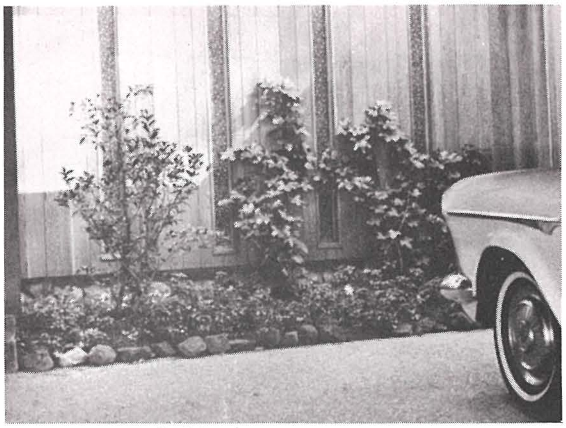
NO REASON why you always have to use customary flat casing around doors and windows. You can create a most interesting picture-frame effect by framing the door with common drip-cap molding. Decorative in itself, the molding produces a pleasing shadow effect, when mitered at the corners and applied taper-side in. The sketch shows how the molding is set back ¼ in. from the edge of the door frame and nailed on edge through its lip. Molding thickness will usually cover the gap between the frame and the wall. The idea is most practical when molding is applied to one side of the door, opposite the door's swing.



A HIGHLY FUNCTIONAL BENCH for a modern entryway is this "masonry" one which offers storage for boots and other rain gear. Basically, it's a plywood box fitted with doors and covered with simulated sheet stone such as DecroWall. A slab of cored latex rubber, fitted with a tailored cover, provides a comfortable cushion.

Fir plywood, ¾ in. thick, is used for the rough box which has a top but no back or bottom. A brace across the back at the bottom helps to reinforce the end. Typical cupboard-type lip doors are made to lap a frame in the opening and the edges of the stone. The stone treatment goes perfectly with a simulated slate-tile floor, such as the vinyl asbestos surface shown.

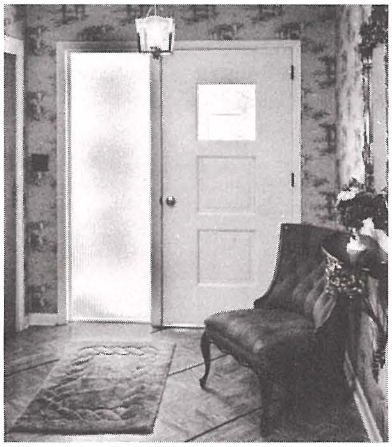


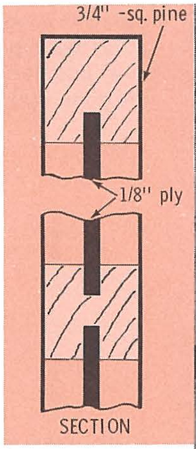


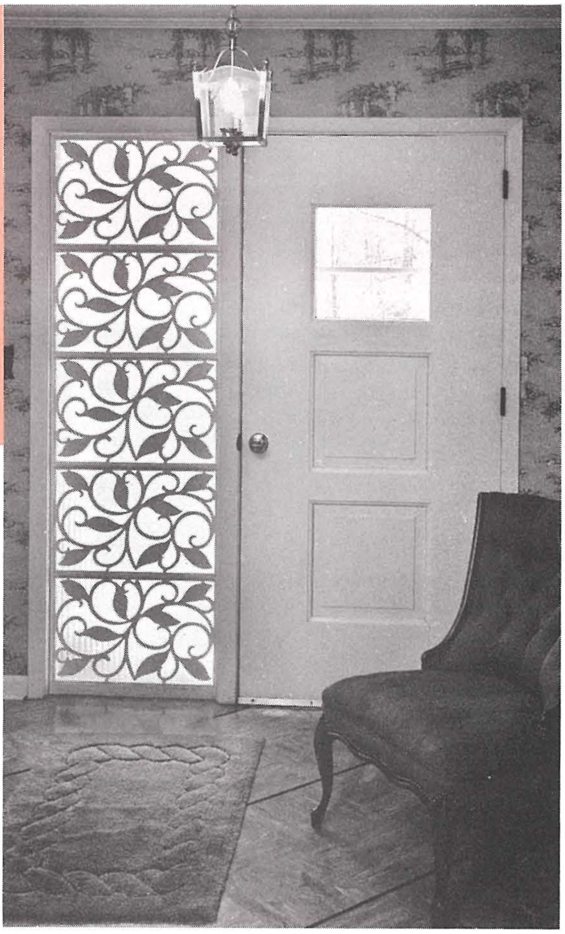
TALL PANELS OF COLORFUL FIBERGLASS provide interesting "stained-glass" windows in this paneled wall facing an unattractive view. Designer Gregory D. Ivy found the windows blended with the vertical paneling, gave a colorful glow to the formal atmosphere of the dining room, and solved the view problem perfectly.

Actually, the fiberglass windows look so attractive you might consider using them even when you aren't trying to cover an undesirable view.

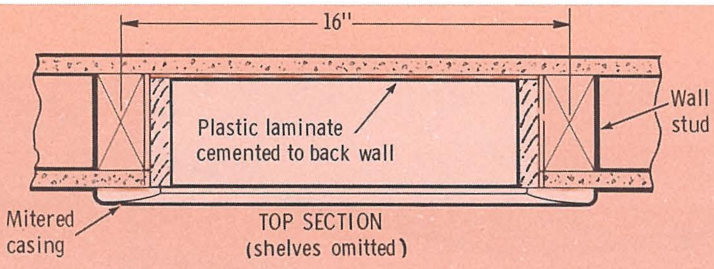
The 8-in.-wide rough openings (12 in. apart) were framed with 1⅛ x 6½-in. members to project ¼ in. beyond the interior and exterior paneling. A rabbet for the fiberglass was formed with ⅜ x 1-in. strips placed 3 in. in from the inside edge. A second strip was used to hold the glass in place. As shown above, the windows are as attractive from the outside as the inside.



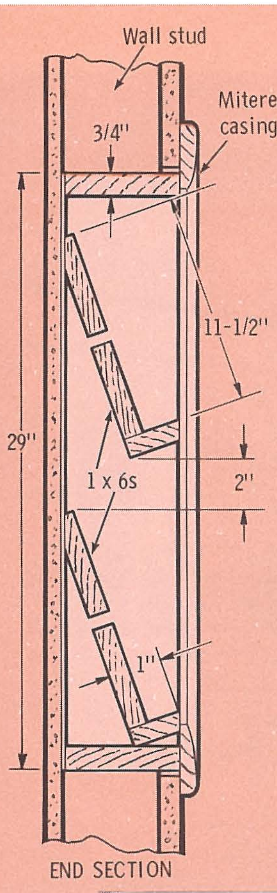




THE GRACEFUL CHARM of a leaf-pattern grille can add a classic look to an austere foyer which features a plain glass panel. This one consists of five ready-cut wood scrolls grouped in a single mitered frame and held in the recessed window with four screws. The detail shows how the ¾-in.-sq. frame members are grooved down the middle to fit over the edges of the scroll-cut panels and form a frame.

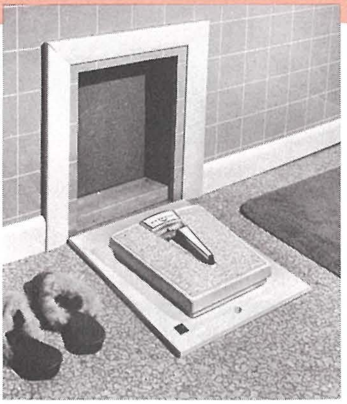


TOP SECTION
(shelves omitted)

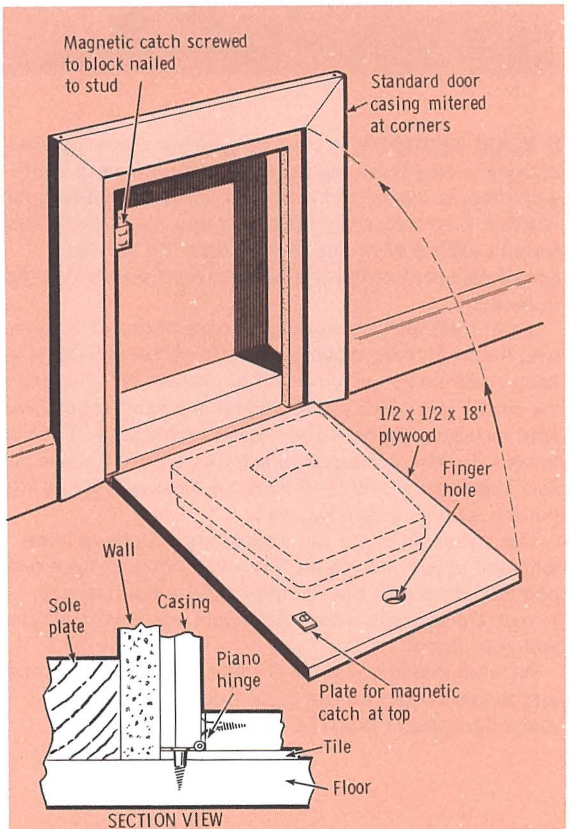


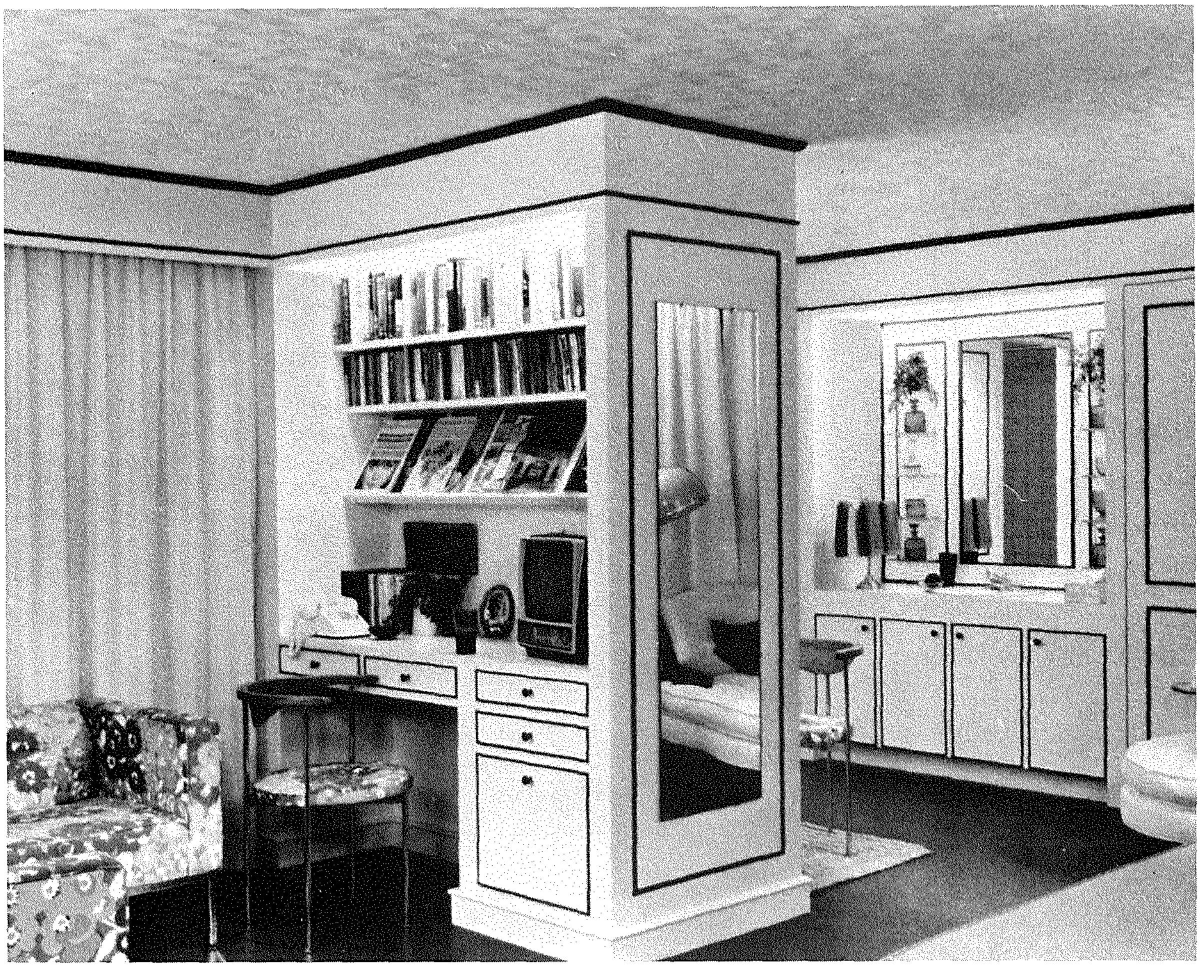
END SECTION

IF YOU ARE ONE who likes to read and soak in the tub, a built-in rack for magazines makes a practical improvement for the bathroom. This one takes no space since it fits flush in the wall. Cut the opening in the wall first. If it's ceramic tile, it will be a bit harder than if plasterboard, although you don't have to do too neat a job since the rack's frame laps any rough edges. The rack is made without a back to gain full depth. The inside wall is painted or covered with plastic laminate before the rack is set in place.



PARDON THE PUN, but a bathroom scale can get underfoot when standing around waiting for that once-a-day weigh-in. However, you can make a scale disappear in the wall and yet be Johnny-on-the-spot by attaching it to a swing-up door. First, pick a spot between two studs and cut a hole that's ½ in. smaller on three sides than the door. Then hinge the door to the floor so it swings flat against the wall and laps the opening. Finally, the baseboard is cut back for a mitered casing which frames the door. A magnetic catch holds the door shut, and a finger hole lets you give a tug to open it. How you attach the scale to the plywood door depends upon the type of scale. Some have holes in the bottom which are adaptable, or the bottom can be drilled for small bolts. Both door and casing can be painted to match the baseboard.


Magnetic catch screwed to block nailed to stud
Standard door casing mitered at corners
1/2 x 1/2 x 18" plywood
Finger hole
Wall
Sole plate
Casing
Piano hinge
Plate for magnetic catch at top
Tile
Floor
SECTION VIEW



IF YOUR BEDROOM is your only haven when Suzie or Johnny invites the gang over for Saturday night, you won't feel so marooned with a get-away-from-it-all spot like this. Likewise, when the adults take over downstairs for an evening of bridge, it will serve the kids as a comfortable out-of-the-way place to read, watch TV or do homework.

It's a great idea for putting a spare bedroom to good use, the main feature being a divider wall which earns its keep and then some. A his-and-hers affair, it's split down the center to provide a dressing table and mirror on one side and kneehole desk and shelves on the other. The big full-length mirror lets everyone look his best. It starts out as a T-shape wall with a 10-in. soffit. Desk and vanity are built-in against a dividing wall.

The dimensions are not critical and will have to be adjusted to your floor plan. The version shown here was painted white with dark stripes around the drawers, mirror, etc. to provide contrast. Again, you can finish it to suit your decor.

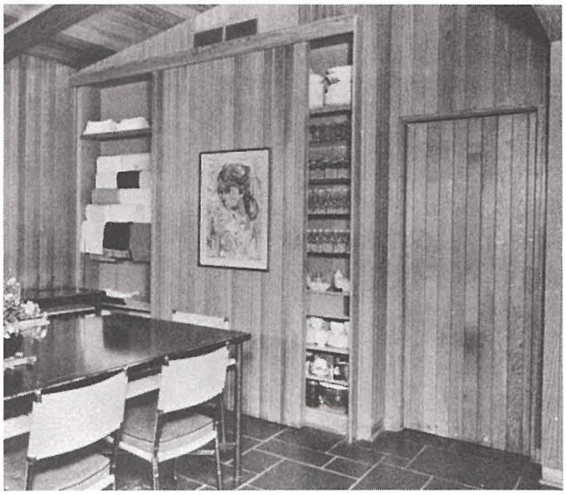
We illuminated our version with standing floor lamps and lamps placed on the desk, but you could also place fluorescent bulbs in the top.

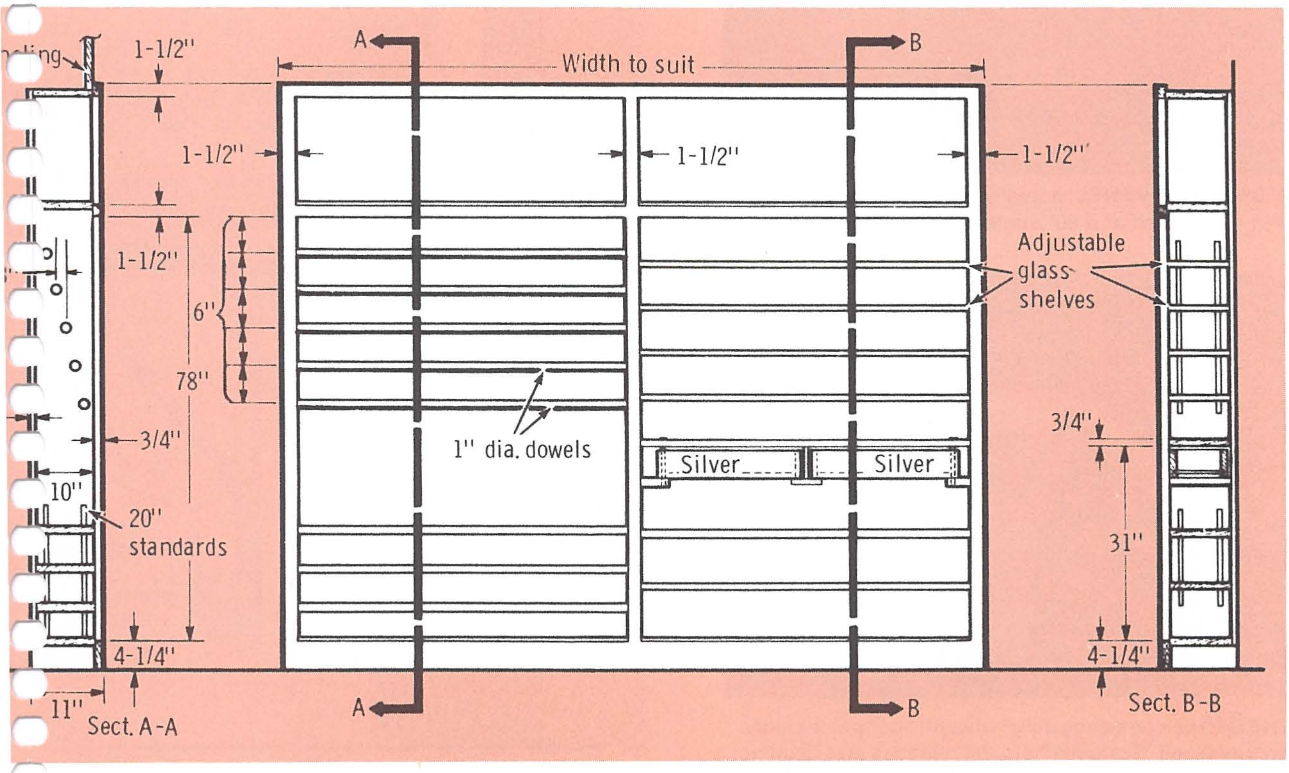
MAYBE YOU DON'T KNOW what it means to be able to store table linens without creases, but your wife does. And she'll think you're the greatest guy ever if you surprise her with a built-in buffet cabinet like this one. It takes only 11 in. in depth and hides behind sliding doors which masquerade as wall paneling. Camouflaged by a picture, the unit looks like an unbroken wall when the doors are closed.

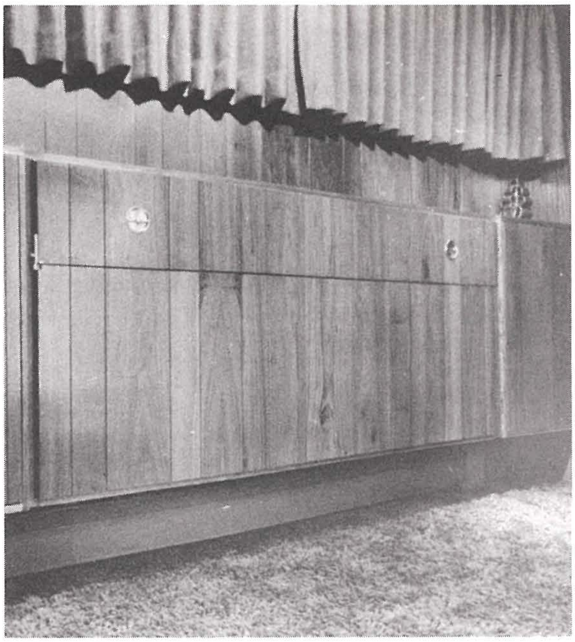
Actually it's two cabinets in one, one side having adjustable shelves for china and crystal, plus two drawers for silverware; the other having rows of 1-in. poles for hanging 52-in.-wide table linens. With no creases or folds, the linens can be used immediately without a second pressing.

If you have plastered walls, you'd still create a second wall 11 in. out from the existing wall, frame a 10-ft. opening, then set the premade cabinet in it and add trim around three sides. The silverware drawers measure 10x22x9 in. and swing out for full access. Dowel pins in the front corners of the drawers pass through fixed shelves, above and below. Clearance is left at the sides so the drawers will swing in and out without binding.

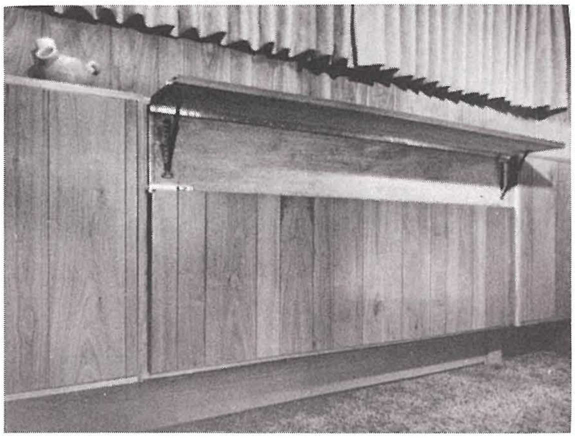
The best place to locate the cabinet is in the dining room near the table so that the silver, linens, china, and crystal will be at hand when you are entertaining. Whichever wall you choose, you will want to panel the wall to match the cabinet if it's not already paneled.



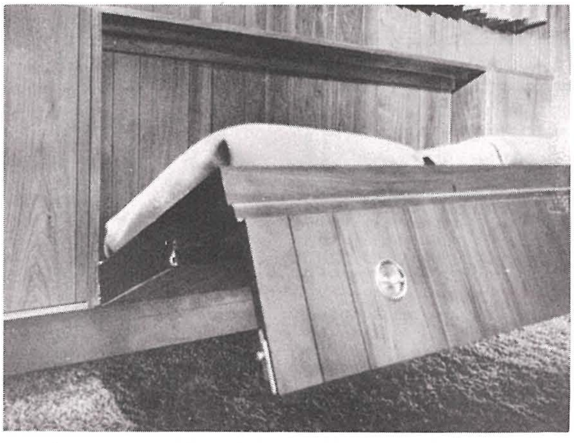




OUT OF SIGHT but not out of mind, there's an extra bed waiting for that unexpected overnight guest.



A SWING-UP PANEL, actually the bed's leg, is opened first and locked at a 90° angle by table-leaf brackets.



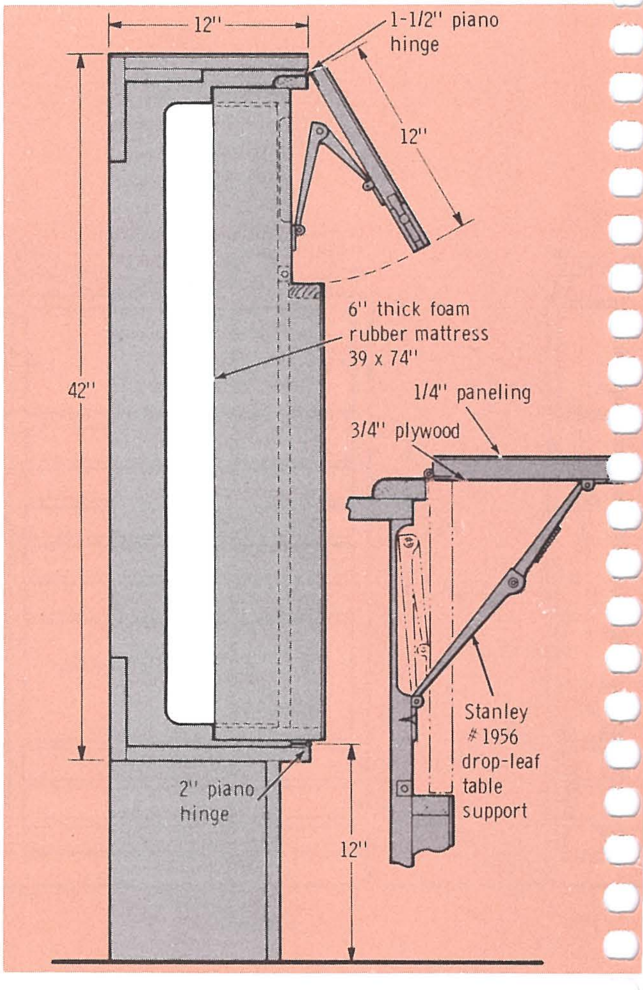
THE BED can be swung down when the bolts at the sides are unlocked. Seatbelts hold the mattress and bedding.

HOW ARE YOU FIXED for an extra bed? Could you put up an unexpected guest for the night? This bed is stored out of sight for just such emergency use. It swings down like a Murphy bed and up again.

As you see in the photos at the left, the bed pivots flush in a shallow cabinet that's only 12 in. deep and which extends wall to wall. Flanking bedding-and-storage cabinets at each end of the bed add to its overall convenience. The resulting ledge across the top provides a welcome shelf area for books, bric-a-brac, toys and pictures.

The tray-like bed frame holds a standard 6-in.-thick foam-rubber mattress. This along with a double sheet, bedspread, blanket and pillow is strapped in place with regular car seatbelts to fold intact.

The original unit was installed in a small dressing room off a master bedroom paneled with prefinished plywood. The paneling shows through the open back when the bed is down and provides a finished look. Matching paneling was used on cabinet doors and underside of the bed to give the unit a built-in appearance.



12"
1-1/2" piano hinge
12"
6" thick foam rubber mattress 39 x 74"
42"
1/4" paneling
3/4" plywood
Stanley #1956 drop-leaf table support
2" piano hinge
12"

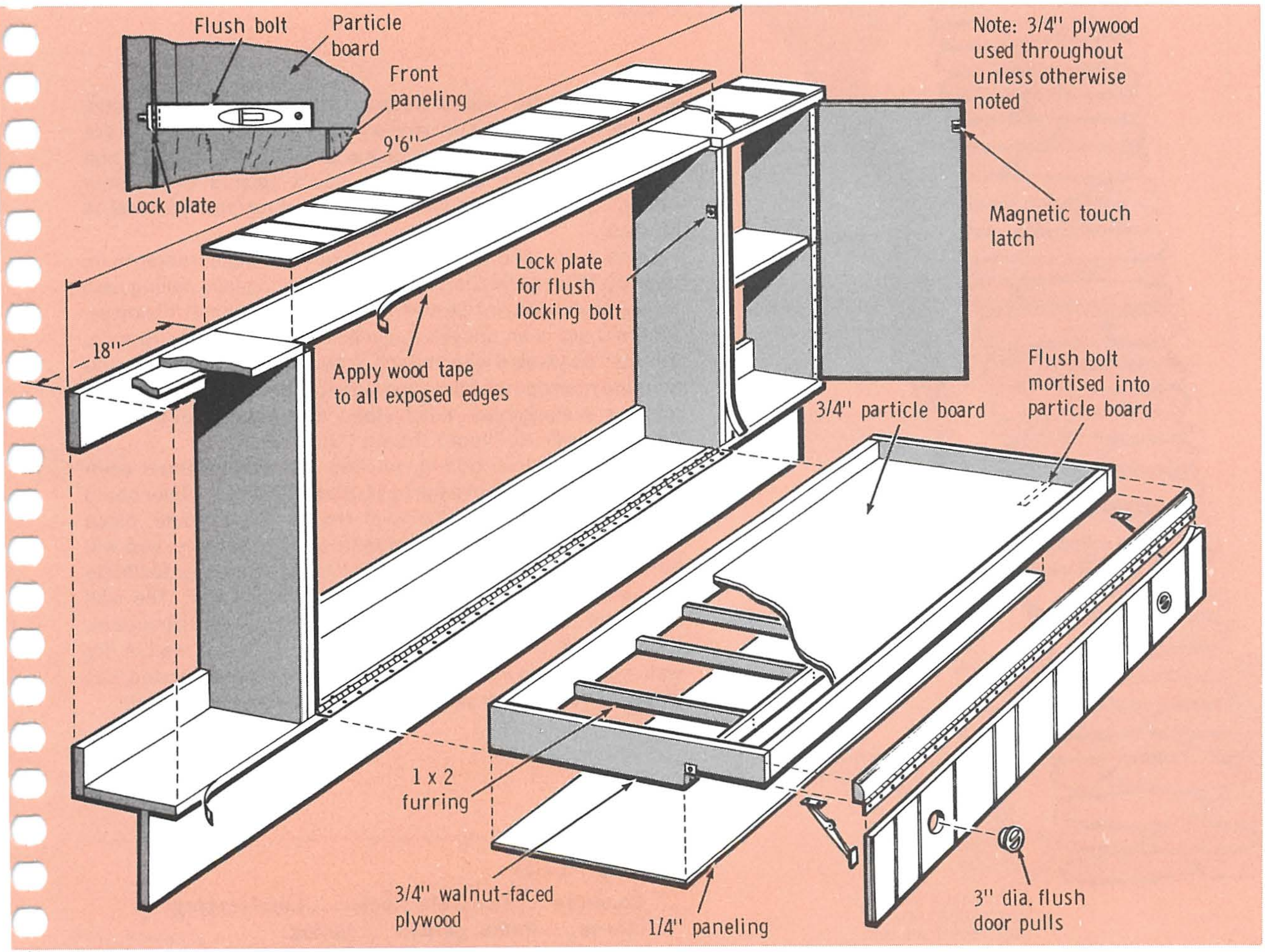
Basically, the unit consists of three cabinets, all more or less built in place and supported by a single shelf board 12 in. off the floor. Top and bottom cleats, screwed securely to wall studs, hold all units firmly to the walls and floor.

In the drawing, note how the bed's hinged "leg" folds flush in a recess extending across the top. Clearance for the spring-loaded drop-leaf table supports which hold the leg at 90°, is provided by routing wells in the bottom bed board. King-size piano hinges are used to hinge the leg as well as the bed. Sliding flush bolts lock the bed shut. Room for a bolt at each end of the leg is provided by making the latter an inch or so shorter than the bed. The mattress sits on a piece of ¾-in. particle board.

Finish the unit to match the walls. All exposed edges should be covered with wood tape to match the panelling. The cabinet doors on each end are held closed by hidden magnetic touch locks.

Now when Aunt Ethyl drops in unannounced, you're ready. Just push the surrounding furniture out of the way and fold her bed down from the wall!

THE BED CABINET PROPER is anchored to wall and studs by driving screws through top and bottom cleats.

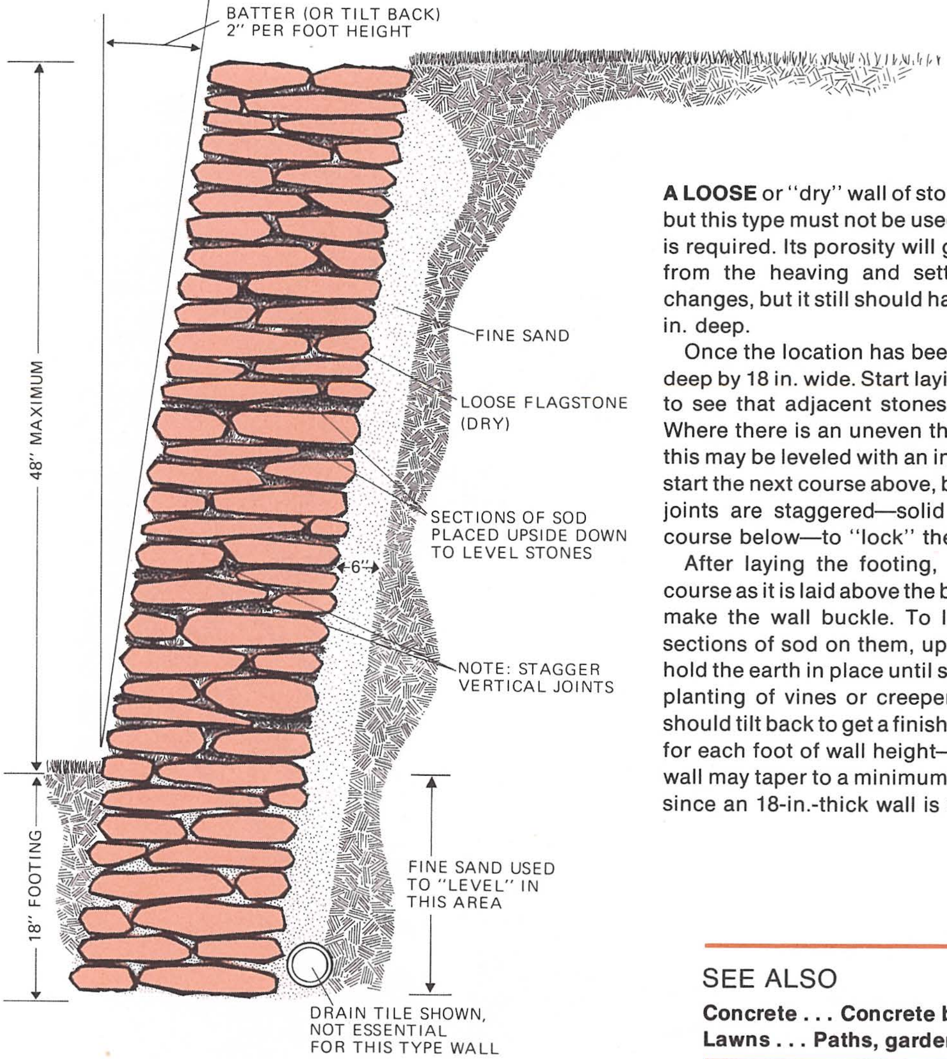


Flush bolt
Particle board
Front paneling
Lock plate
9'6"
18"
Note: 3/4" plywood used throughout unless otherwise noted
Magnetic touch latch
Lock plate for flush locking bolt
Apply wood tape to all exposed edges
Flush bolt mortised into particle board
3/4" particle board
1 x 2 furring
3/4" walnut-faced plywood
1/4" paneling
3" dia. flush door pulls

How to build retaining walls

■ THOUGH A SLOPED piece of ground is often attractive, just as frequently it is a homeowner's headache. Water and wind erosion can raise havoc with the land and, though seeding may solve the problem, it creates another: The resulting growth is hard to maintain. In most cases, a retaining wall—if properly built—is the answer.

One important point to keep in mind: Water trapped behind a retaining wall will cause damage by freezing. Thus, you will need good drainage, such as that provided by laying perforated drain tiles alongside the base of the inside wall as shown. Though drain tiles are desirable behind a dry (stone or tie) wall, they are a *must* behind masonry walls. Tiles should be pitched about ¼ in. per lineal foot and lead to a dry well (or should be elbowed out through the earth at the end of the wall). You should also cover the tiles with at least 1 ft. of coarse gravel. Any moisture will then flow along the asphalted wall and be picked up by the tiles.


BATTER (OR TILT BACK)
2" PER FOOT HEIGHT
48" MAXIMUM
18" FOOTING
FINE SAND
LOOSE FLAGSTONE (DRY)
SECTIONS OF SOD PLACED UPSIDE DOWN TO LEVEL STONES
6"
NOTE: STAGGER VERTICAL JOINTS
FINE SAND USED TO "LEVEL" IN THIS AREA
DRAIN TILE SHOWN, NOT ESSENTIAL FOR THIS TYPE WALL

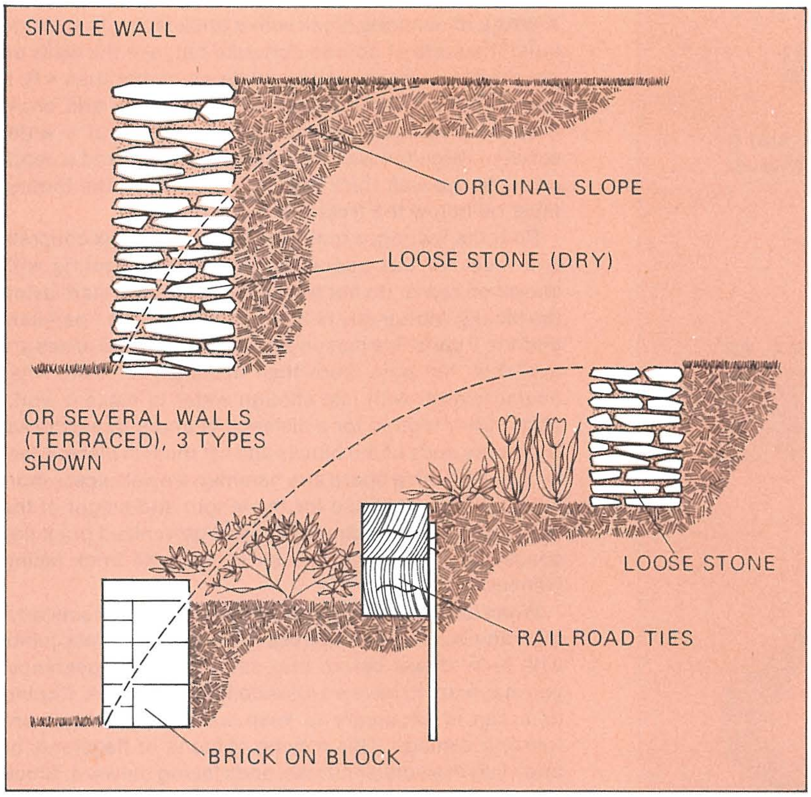
A LOOSE or "dry" wall of stone or flagstone is easiest to build, but this type must not be used when a height of more than 4 ft. is required. Its porosity will give such a wall some protection from the heaving and settling that's caused by weather changes, but it still should have a dry footing (sand) at least 18 in. deep.

Once the location has been determined, dig a trench 18 in. deep by 18 in. wide. Start laying the stone in place, taking care to see that adjacent stones are nearly the same thickness. Where there is an uneven thickness of stones in the footing, this may be leveled with an inch or two of fine sand. When you start the next course above, be sure to place the stones so that joints are staggered—solid stone above each joint in the course below—to "lock" the wall together.

After laying the footing, backfill and tamp behind each course as it is laid above the base grade; backfilling later could make the wall buckle. To level stones above grade, place sections of sod on them, upside down. Roots of the sod will hold the earth in place until settling is complete, also facilitate planting of vines or creepers in the finished wall. The wall should tilt back to get a finished face batter (rake) of about 2 in. for each foot of wall height—about 8 in. for a 4-ft. wall. A dry wall may taper to a minimum thickness of 12 in. at the top, but since an 18-in.-thick wall is stronger, it's recommended.

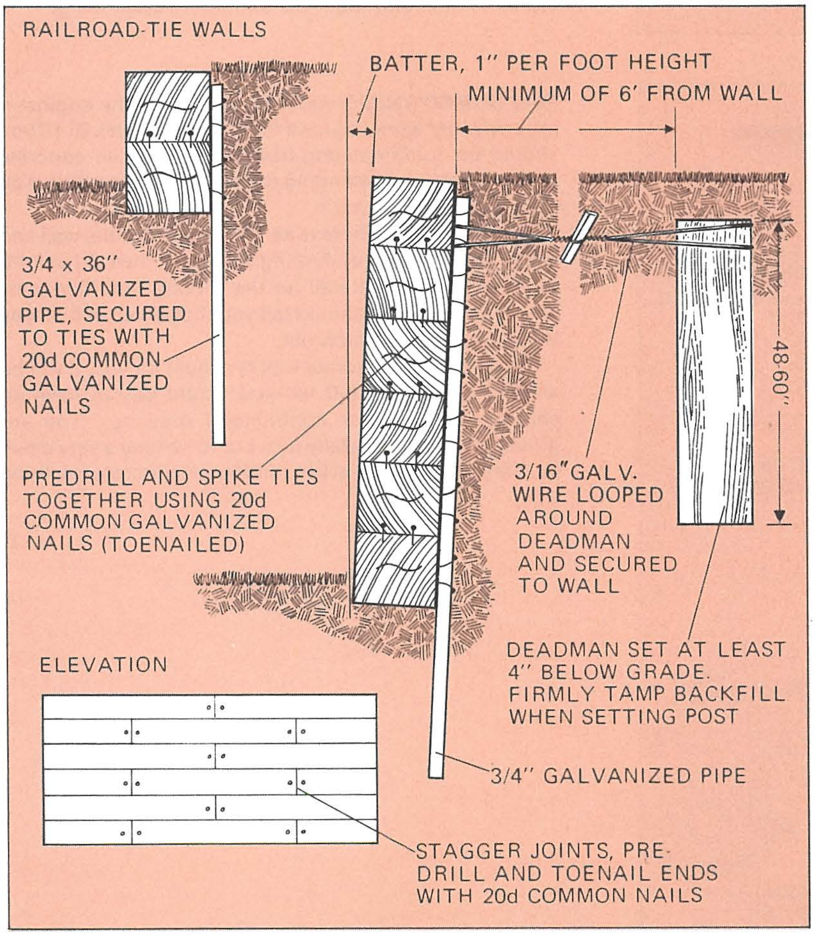
SEE ALSO

Concrete . . . Concrete blocks . . . Landscaping . . . Lawns . . . Paths, garden . . . Patios



THE HIGHER THE WALL, the more complicated and more difficult it will be to construct it. Especially for a greater drop, you may want to consider the alternative of "stepping" or terracing the slope with two or more smaller walls. These may be of different types, as shown in the drawing at left, or all the same.

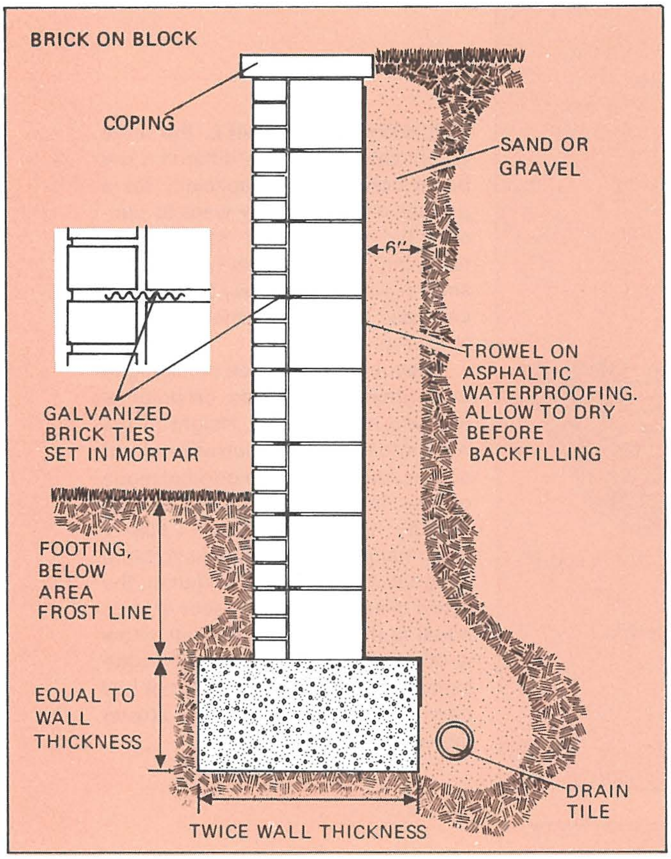
To avoid the nuisance of having to mow grass on the steps, ornamental planting is suggested. Height of the walls and depth of the terraces will, of course, depend on the original slope of the land, and you must have enough horizontal space to step a given height or you will have to build a higher wall. As a rule of thumb, the depth of each terrace must be at least equal to the height of the wall below it; otherwise, the condition will be the same as that of a single wall that has been built too high and not strong enough.


RAILROAD-TIE WALLS
BATTER, 1" PER FOOT HEIGHT
MINIMUM OF 6' FROM WALL
3/4 x 36" GALVANIZED PIPE, SECURED TO TIES WITH 20d COMMON GALVANIZED NAILS
48-60"
PREDRILL AND SPIKE TIES TOGETHER USING 20d COMMON GALVANIZED NAILS (TOENAILED)
3/16"GALV. WIRE LOOPED AROUND DEADMAN AND SECURED TO WALL
DEADMAN SET AT LEAST 4" BELOW GRADE. FIRMLY TAMP BACKFILL WHEN SETTING POST
ELEVATION
3/4" GALVANIZED PIPE
STAGGER JOINTS, PRE-DRILL AND TOENAIL ENDS WITH 20d COMMON NAILS

A RETAINING WALL made of used railroad ties is nearly as easy to erect as a dry stone wall. While the footing required is not as deep, hauling and placing ties—weighing about 210 lbs. each—will require help. Ties up to three tiers high can be stacked, if joints are staggered, with only a leveled trench 6 in. deep for a footing. A section of ¾-in. galvanized pipe, driven at least 18 in. into the earth and clinched to the ties with 20d galvanized common nails, will hold them.

Walls higher than three tiers should employ "deadmen" in addition to pipe support. A deadman is a device driven into the ground away from the wall (usually about 6 ft. back) and tied to it to help it resist outward earth pressure. A section of tie in a post hole is ideal as its width will keep it from cutting into the soil. You can also use galvanized pipe of at least 1½-in. diameter driven into the earth. Either type deadman is fastened to the tie-pipe on the wall with several turns of 3/16-in. galvanized tie-wire, tightened like a tourniquet.

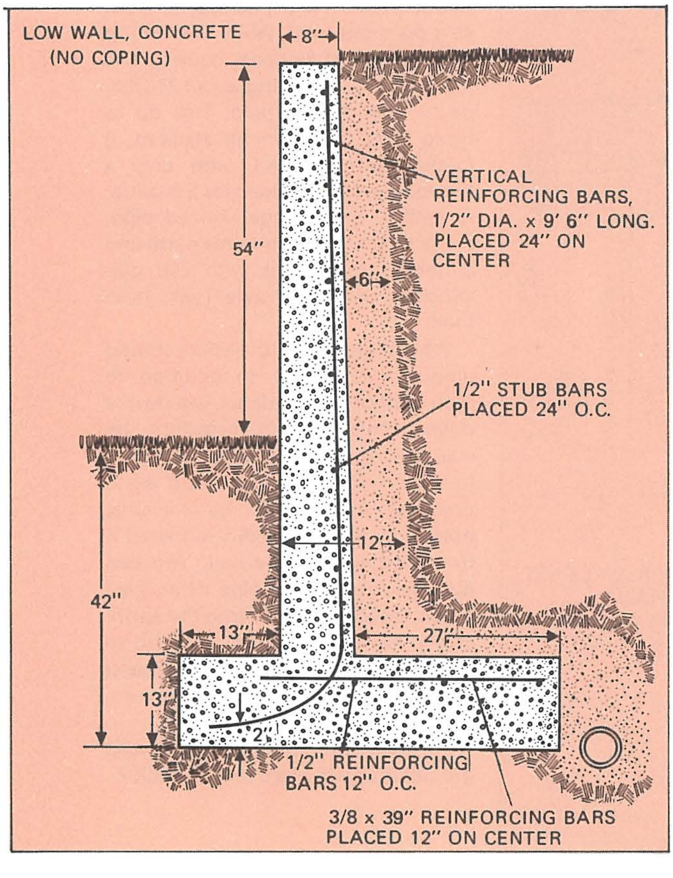
For construction of retaining walls greater than 4 ft. high, see page 2567.


BRICK ON BLOCK
COPING
SAND OR GRAVEL
6"
TROWEL ON ASPHALTIC WATERPROOFING. ALLOW TO DRY BEFORE BACKFILLING
GALVANIZED BRICK TIES SET IN MORTAR
FOOTING, BELOW AREA FROST LINE
EQUAL TO WALL THICKNESS
DRAIN TILE
TWICE WALL THICKNESS

A WALL of concrete block with a brick facing is easier to build than one of poured concrete but, like the walls on the preceding pages, it should be no higher than 4 ft. It can be built in three stages—footing, block and brick. Determine its location and dig the footing of a width equal to twice the wall thickness at its base and a depth equal to the wall thickness. The bottom of the footing must be below the frost line in your area.

Pour the footing; a rented mixer or ready-mix concrete is a must for this operation. Level top of footing with shovel or board; do not trowel. The next day, start laying the blocks. Mortar mix is 1 part cement, about 1 part lime and 4 to 6 parts fine mason's sand. Commercial mixes are available, but cost more than making your own. After mixing mortar with just enough water to make it workable, butter footing for a distance of about three blocks. Butter the ends of the blocks and set them in place. Level by tapping with a board and hammer; trowel excess mortar off joints. Continue for the length and height of the wall. For maximum strength, insert galvanized brick ties spaced 3 ft. apart into mortar to hold the brick facing (veneer).

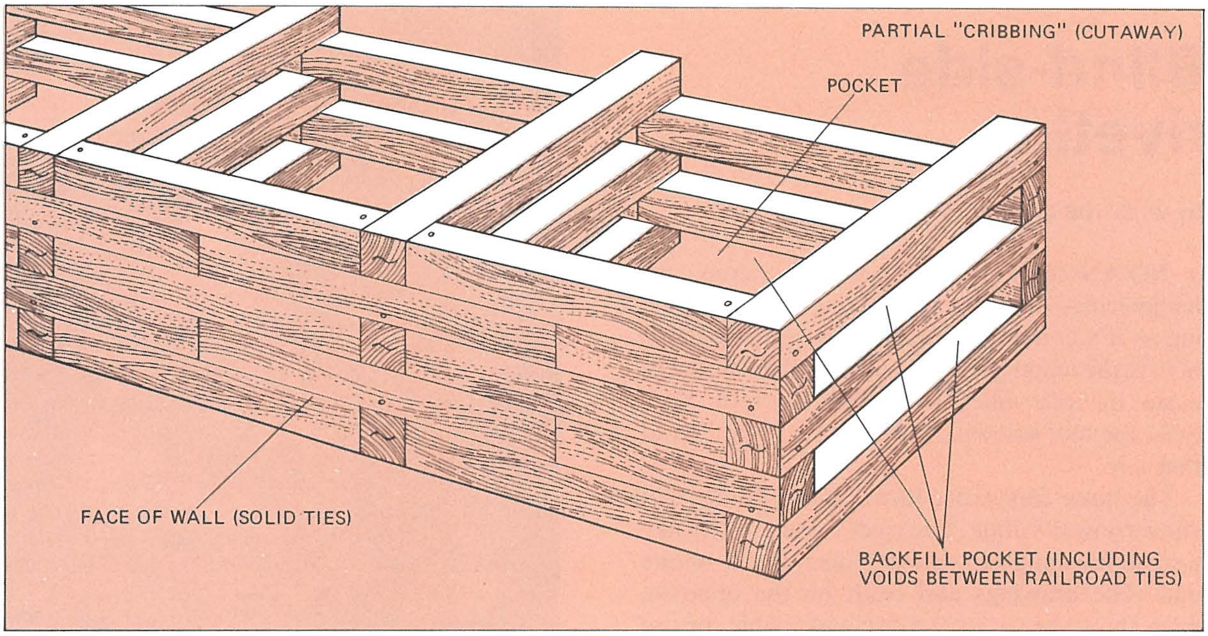
When the block backup is complete, lay brick similarly, inserting brick ties in corresponding joints. Dress joints with ⅜-in. dowel before they set. For best appearance, you may want to have a professional lay the brick. Coping or a cap is necessary to keep water out and prevent freezing damage. This may be of stone or flagstone, or brick laid in a soldier course, ends facing outward. Block should be coated on the earth side with a thick layer of asphaltic mix, and drain tile set before backfilling.


LOW WALL, CONCRETE (NO COPING)
8"
54"
VERTICAL REINFORCING BARS, 1/2" DIA. x 9' 6" LONG. PLACED 24" ON CENTER
6"
1/2" STUB BARS PLACED 24" O.C.
12"
42"
13"
27"
13"
2"
1/2" REINFORCING BARS 12" O.C.
3/8 x 39" REINFORCING BARS PLACED 12" ON CENTER

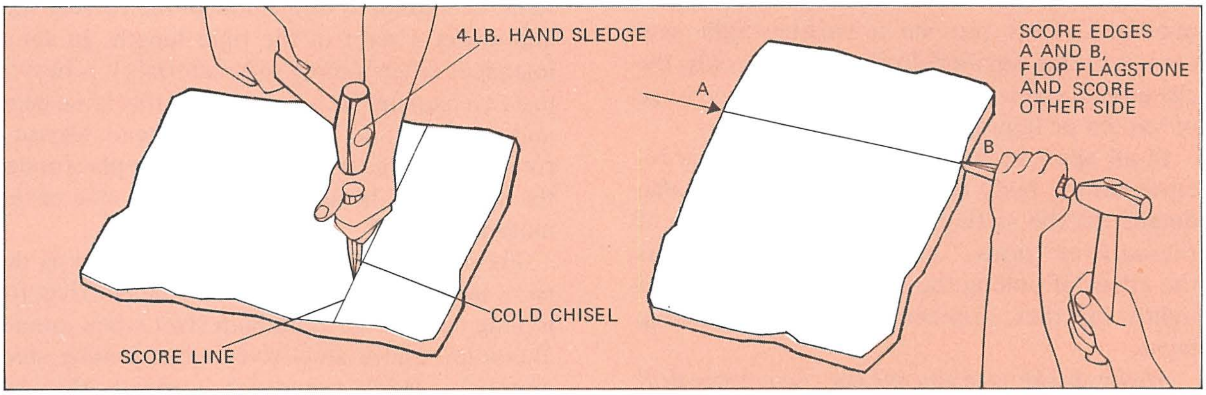
FEW HOMEOWNERS will want to take on the engineering and other work required for this type of wall. But if you should be contemplating having a reinforced concrete wall built, an understanding of the design principles is an important consideration.

The footing used here is an integral part of the wall and is tied to it by steel reinforcing bars. The "head" (weight) of earth behind the wall on the footing determines its size. If a contractor should tell you that a wall of this type is "no problem," watch out.

If a reinforced concrete wall is a must for you, it will be worth the $75 to $100 fee you would pay to have an engineer check your contractor's drawings. The engineer's fee will generally turn out to be only a very small portion of the total cost of a reinforced concrete retaining wall.


PARTIAL "CRIBBING" (CUTAWAY)
POCKET
FACE OF WALL (SOLID TIES)
BACKFILL POCKET (INCLUDING VOIDS BETWEEN RAILROAD TIES)

IF YOU NEED a retaining wall higher than 4 ft. and want to build it yourself, the method to use is called "cribbing" railroad ties. The job will be a lot of work, and you should allow plenty of time for it, but the result will be a self-draining wall of great thickness and strength. Essentially the construction of a series of boxes, cribbing requires cutting, predrilling and spiking of ties, as well as the moving of a large amount of earth. *Caution:* Railroad ties are "pressure-treated"—creosoted clear through the wood—so be sure to wear goggles while cutting them (using a two-man saw or portable circular saw with coarse-set or rip blade). Face of the wall is solid, with joints staggered. Holes are predrilled and ties spiked together by toenailing with 20d galvanized common nails. Then the pocket is backfilled. Earth in the pocket acts structurally as part of wall; voids between ties allow for drainage through sides, reducing pressure on face of the wall.


4-LB. HAND SLEDGE
COLD CHISEL
SCORE LINE
SCORE EDGES A AND B, FLOP FLAGSTONE AND SCORE OTHER SIDE
A
B

WHEN YOU HAVE to cut a piece of flagstone or fieldstone to get a straight edge to lay, use a cold chisel and hammer or mall (hand sledge). First score a guideline on both flat sides of the stone, then nick the edges about ⅛ in. deep to join the score marks on the flat surfaces. Then lay the stone on the ground to nick the scoring on the flat sides, also to a depth of ⅛ in. When the scoring has been deepened on all four sides, continue tapping, but now with harder blows. Go all the way around, working from the middle of each side outward toward the edges, until the stone breaks along the score.

Done correctly, this entire operation should take about five minutes. Object of the scoring is to make the break occur where you want it; otherwise, efforts with hammer and chisel are almost bound to result in a fractured, useless stone.

Blind-side riveting

By W. CLYDE LAMMEY

■ NO ANVILS, no turning of the materials, no hammering—that's blind-side, or "pop" riveting as it's commonly called. You simply drill a hole in the materials to be joined, insert the rivet, close the plier-like handles of the tool, then twist the tool sidewise to break the "nail." And that's it.

The three-step procedure detailed at the right shows how it's done. The rivet you use looks like a small finishing nail with a flanged sleeve at one end. The drawings and chart on the opposite page show the variety of rivets available for use with the common hand-operated tool. Dealers in industrial supplies stock a much greater variety of sizes and types of rivets, along with hand and power tools for application.

Notice that there are both open and closed-end rivets, and that these come in dome head, large flange and countersunk head styles. Also note that they come in a range of lengths for joining materials from ⅛ to ⅝ in. thick, and in aluminum, steel and copper. Stainless steel and monel metal rivets are also available for industrial uses where corrosion-resistant rivets may be necessary.

When joining thin materials, back-up plates, or washers, should be used to prevent possible kinking of the material when the rivet is set. The open-end rivets provide a weather-tight seal even with the smaller dome head but only the closed-end rivets provide a seal against passage of vapors or liquids.

In all applications, the head (mandrel) is retained in the body of the rivet as shown in the details. In the setting of the rivet, a degree of pressure, or "draw," must be exerted. This has the effect of pulling the materials being jointed tightly together, preventing shifting or shaking loose.

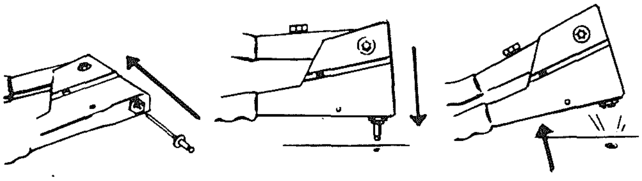
Always make sure you use the correct size drill for the rivet. Check the chart on the opposite page for the correct drill size. When joining dissimilar materials, such as metal to hardboard or metal to wood, or even wood to wood, where the combined thicknesses of the materials are, say, ½ in. be careful to drill a hole of the correct size and select a rivet of the right length. In some instances when joining soft materials it is best to use two backup plates, one under the dome head and another under the secondary head. Or use a rivet with a large flange and a backup plate under the secondary head on the opposite side of the material.

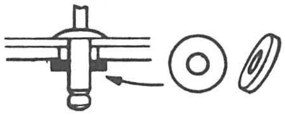
The rivet should be of the same metal as the parts being joined; that is, use a copper rivet for joining copper, an aluminum rivet when joining aluminum and a steel rivet when joining steel materials. Don't use rivets in metals that are incompatible—an aluminum rivet in steel, or copper in aluminum. The parts may corrode and the materials weaken, causing failure. Avoid using rivets that are rusted or otherwise damaged, and don't attempt to join badly rusted materials. Again the result can be failure of the joint.

SEE ALSO

Bolts . . . Fasteners . . . Nails . . . Screws . . . Staple guns

EVEN LARGE sheet-metal items can be assembled with "pop" rivets. Below, insert the rivet into the nosepiece, push head of rivet into hole, then squeeze the handles. This spreads the rivet on the blind side and breaks off the "nail" in the nosepiece.



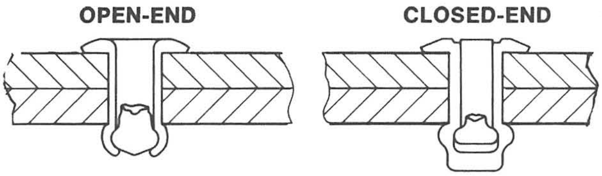


BACKUP PLATES

BACK UP PLATE NUMBER	BACK UP PLATE MATERIAL	USED WITH	QUANTITY PER CARD	QUANTITY PER BOX
S-BUP4	STEEL	⅛" DIA. RIVET	40	500
A-BUP6	ALUM.	3/16" DIA. RIVET	30	500
A-BUP4	ALUM.	⅛" DIA. RIVET	40	500

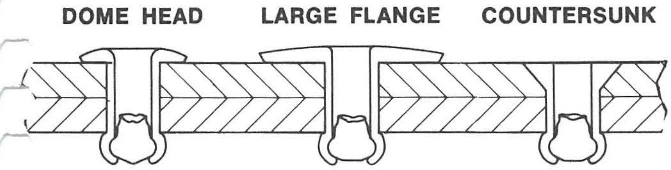
WHEN JOINING thin sheets, use a back-up plate. This precaution avoids kinks in the thin stock and makes the joint much more rigid.

"POP" RIVET TYPES

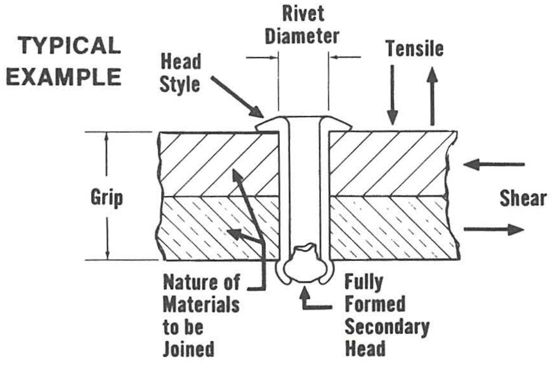


POP RIVETS are available in both open and closed ends. Use closed-end rivets for joints which must be liquid-tight or vapor-tight.

HEAD STYLES



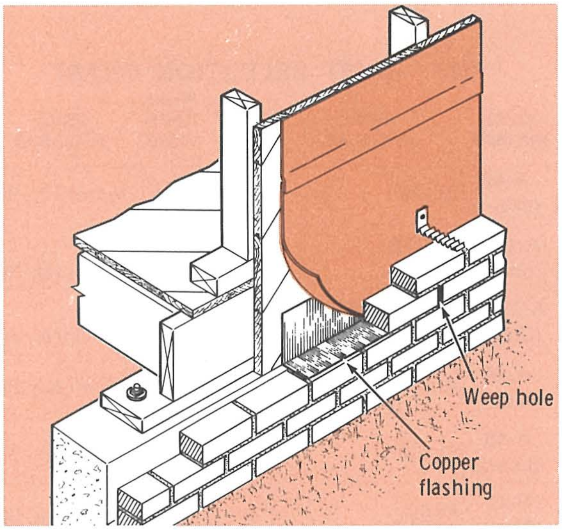
THERE ARE THREE common types of head styles. Below, when joining dissimilar materials be sure you use rivets of proper length and diameter.



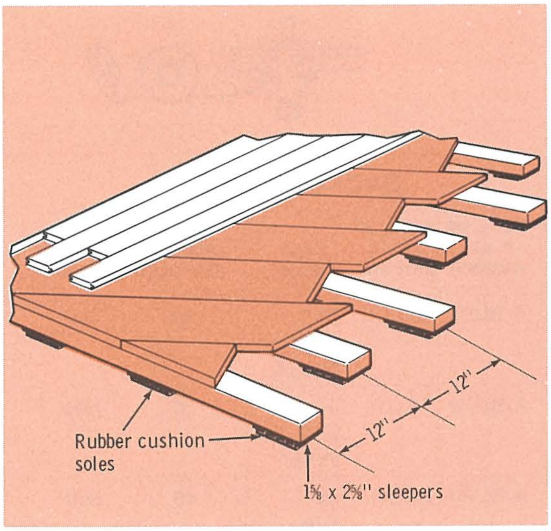
"POP" RIVET SELECTION CHART

RIVET NUMBER	RIVET MATERIAL	RIVET DIA.	WORK THICKNESS	DRILL REQUIRED
A-42 (Short)	ALUM.	⅛"	⅛"	⅛" or No. 30
A-42W (Short)	WHITE ALUM.	⅛"	⅛"	⅛" or No. 30
A-42CE (Short)	CLOSED-END ALUM.	⅛"	⅛"	⅛" or No. 30
A-44 (Med.)	ALUM.	⅛"	½"	⅛" or No. 30
A-48 (Long)	ALUM.	⅛"	½"	⅛" or No. 30
S-42 (Short)	STEEL	⅛"	⅛"	⅛" or No. 30
S-42CS (Short)	COUNTERSUNK STEEL	⅛"	⅛"	⅛" or No. 30
S-42LF (Short)	LARGE FLANGE STEEL	⅛"	⅛"	⅛" or No. 30
S-44 (Med.)	STEEL	⅛"	¼"	⅛" or No. 30
S-48 (Long)	STEEL	⅛"	½"	⅛" or No. 30
C-42 (Short)	COPPER	⅛"	⅛"	⅛" or No. 30
A-62 (Short)	ALUM.	3/16"	⅛"	3/16" or No. 11
A-64 (Short)	ALUM.	3/16"	¼"	3/16" or No. 11
A-64CE (Short)	CLOSED-END ALUM.	3/16"	¼"	3/16" or No. 11
A-68 (Med.)	ALUM.	3/16"	½"	3/16" or No. 11
A-610 (Long)	ALUM.	3/16"	⅝"	3/16" or No. 11

CHART GIVES data on pop rivets in common use for installation with hand-operated tool. Below, here's a job made to order for these handy rivets.

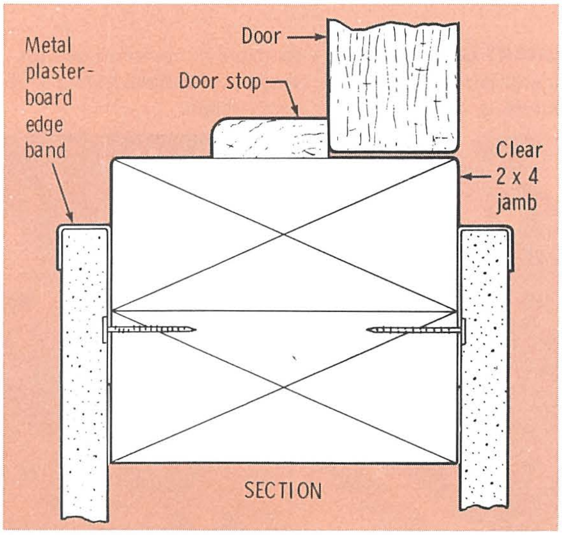


EVEN THOUGH you make sure that dry lumber is used in your new home, it's equally important to see that it remains dry when in place. Excessive moisture entering walls from below can cause dry lumber to shrink and swell and be the cause of cracking plaster. The wise homeowner will have flashing installed around the foundation of brick construction.

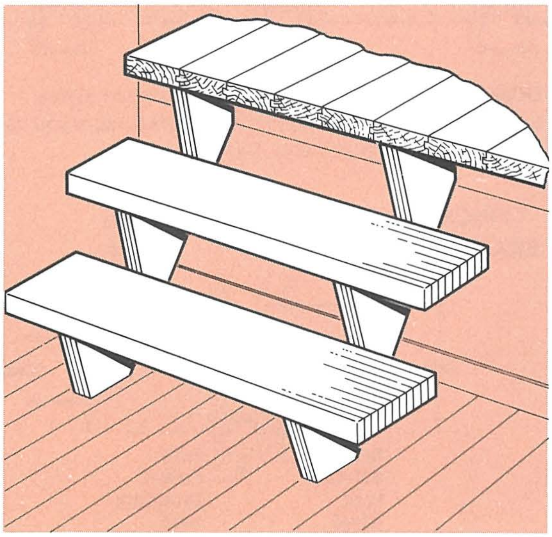


WHEN YOUR REMODELING plans call for a wood floor over a concrete slab, you can save money by using Potlatch's cushion-sole sleepers as a substitute for floor joists. Fitted with rubber soles 12 in. apart, the sleepers provide a pleasant floor resilience and also reduce noise. The sleepers (screeds) come in 3, 4, 5 and 6-ft. lengths and are 2 in. thick overall.

YOU CAN SAVE on door and window trim by trimming with gypsum-board edge band instead of regular casing. No frame is used; nail the metal band to the door studs ½ inch from the edge and miter at upper corners. Then slip the plasterboard into the channel.



LAMINATED FIREPLACE mantels make fine ready-made treads for interior cottage steps. Vertically laminated hardwood, they are handsome and durable. Likewise, laminated beams make equally fine members for stringers and won't warp or check like common planks.



Rolling-pin catchall

By **WALTER E. BURTON**

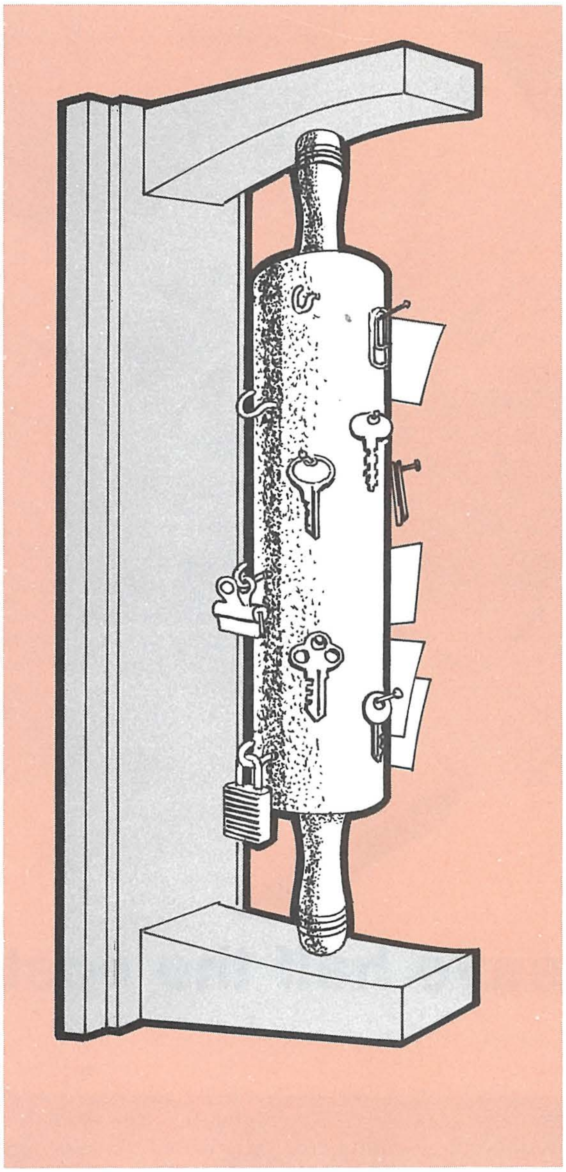
■ AT HOME in a kitchen or dining room, this spinning catchall is easily made from a wooden rolling pin. Often you can obtain slightly used rolling pins at a flea-market sale or a used-merchandise store for as little as a dime each, which was the cost of the one shown here.

The tips of the rolling-pin handles rest in cup-shaped recesses cut in two wooden arms extending from a ¾-in. back panel. The panel is mounted on a wall with roundhead screws but, if provided with a sufficiently heavy base, it also could be used on a table or desk.

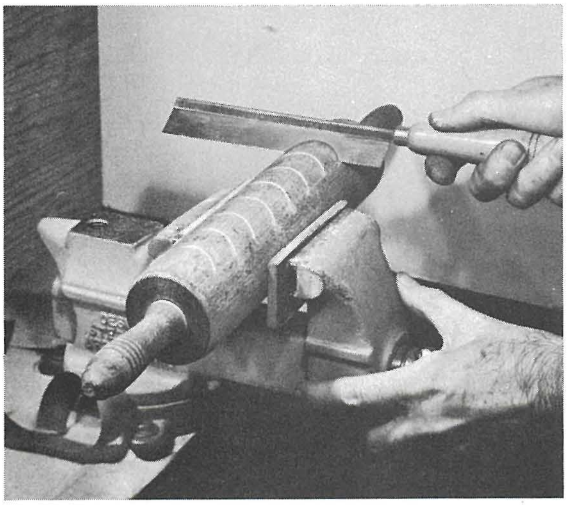
The two arms can be made by gluing together two pieces of ¾-in. stock. The cuplike recesses for the rolling-pin handles are about ½-in. deep and are made by first boring a hole with a regular bit, then reaming, filing or carving the resulting recess to shape.

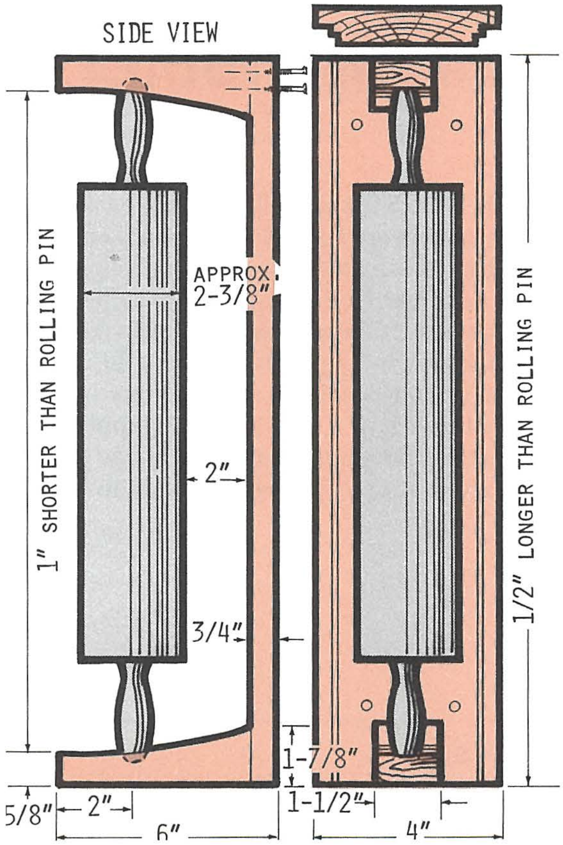
SEE ALSO

Comb boxes . . . Gifts, Christmas . . .
Kitchen accessories . . . Lazy Susans . . .
Plexiglass projects . . . Salt-and-pepper shakers



FINE SAW KERFS will hold messages, business cards and other reminders. Cup hooks keep keys handy.





If you are like this homeowner, you will want to save yourself a bundle by applying your own shingles all the way up to the ridge. You may have all the tools you need right in your own toolbox

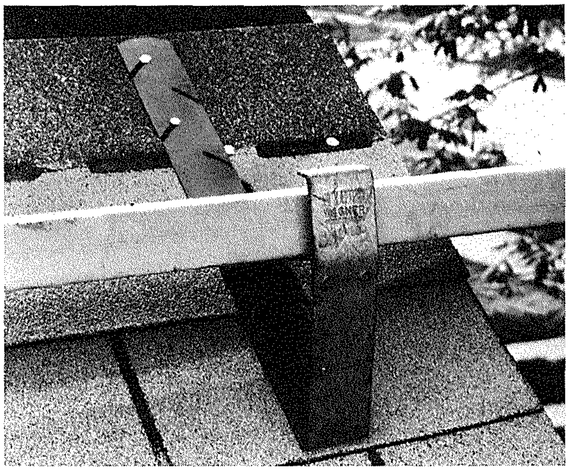
Be your own roofer and save half the cost

■ THE WORST ASPECT of shingling a roof is having to work *up there*. But, if you are fortunate enough to have a roof with a reasonable pitch—a ranch or Cape Cod home, for example—you might consider taking on the job and pocketing at least half of what a professional would charge.

Even if you decide to call in a pro, a good knowledge of how a roof should be applied will put you in a position to make sure that you get the job you are paying for. It's okay to put the

SEE ALSO

Gutters and downspouts . . . House additions . . . Ladders . . . Scaffolding . . . Sheathing . . . Siding



SCAFFOLD HANGERS are necessary for safety. You'll need at least two pairs to work your way up the roof safely. They are attached by driving in 8d common nails after locating the bracket so that shingling can continue. To move the bracket to a new position, it is simply tapped up and the nails that held it are driven home. Use at least a 2x6 plank.

new roof over the old, but if there are already two layers of shingles up there, the roof should be stripped and the job started from scratch. On a new roof, use 1¼-in. galvanized nails. If installing a second layer over asphalt shingles, up the size to 1¾-in. galvanized nails. You'll need that extra length to assure good holding power.

About asphalt shingles: The square-butt shingle measures 12x36 in., has three tabs and is normally laid with 5 in. exposed to the weather. There are 27 strips in a bundle and three bundles make up a square (100 sq. ft.). Store the bundles of shingles flat or the strips are likely to curl as the bundles are opened for use.

repairing old roof

Begin by checking the old roof, nailing down any loose shingles and replacing any that are damaged. If warped or rotten boards (sheathing) are present, usually under bumps or bulges, remove the shingles, replace the boards and weave in replacement shingles.

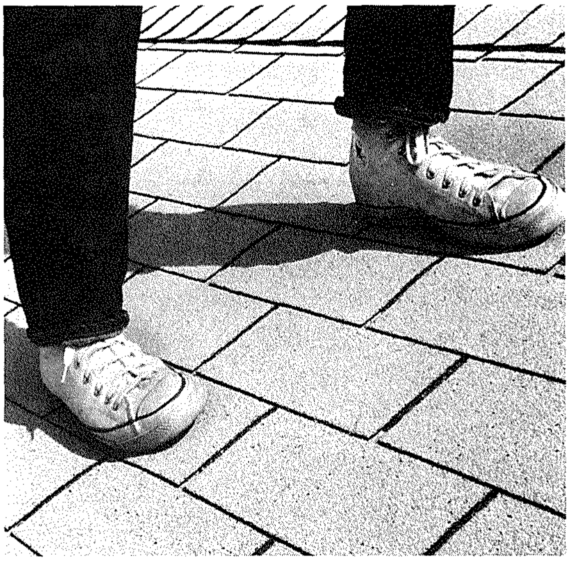
Start the reroofing by laying the valleys in first. Measure for length and cut the roll roofing. Roll the pieces up and place a roll at each valley. (Your local code might require the use of metal flashing instead of roll roofing.) Width of flashing to use in a valley is determined by roof pitch. The usual is 12 in. wide for slopes of 7 in. in 12 and over; 18 in. wide for 4 in. in 12 to 7 in. in 12 slopes and 24 in. for slopes less than 4 in. in 12.

After applying 15-lb. felt with staples, the starter course can go down. It can be either wood or asphalt shingles (applied upside down) as in the drawing. In any event, the starter course should be applied so it projects at least ½ in. over the eaves. This will prevent water from running back up under the shingles. A ½-in. shingle projection should also be used at the rake (gable) ends.

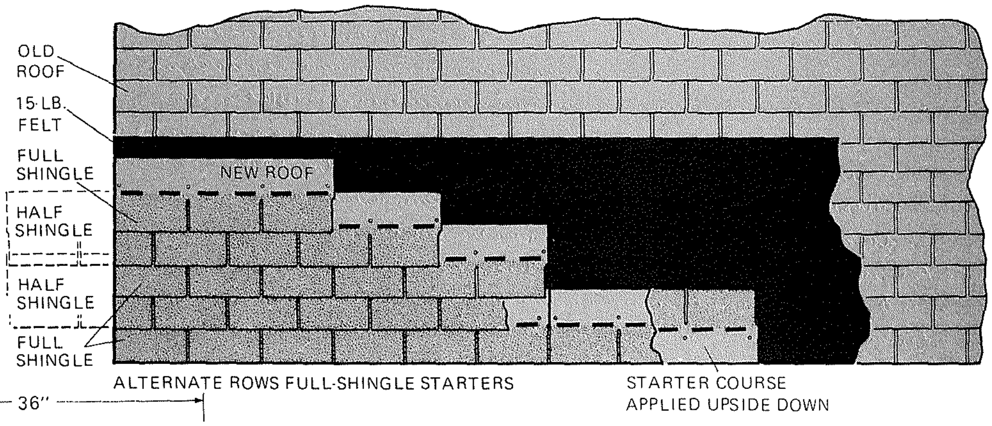
The shingles are applied on up to the ridge and once all shingles are in place, they can be trimmed at the valleys. Measure at least 2 in. either side of the valley center at the top and 3 or 4 in. both sides at the bottom (eaves). Drive a nail at each of these four spots, attach a chalkline and snap to determine where shingles should be cut.

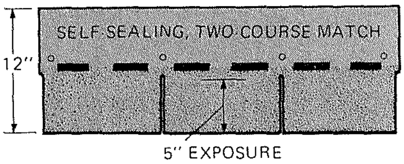
Use a piece of ⅜-in. plywood *under* the shingles along the valley. Place the carpenter's square along the chalkline on top of the shingles and cut with your utility knife. Remove cutaway pieces, finish nailing the trimmed shingles and apply roof cement to the edges.

Capping at the ridge can be done with a 12-in.-wide strip of roll roofing. But it is more com-



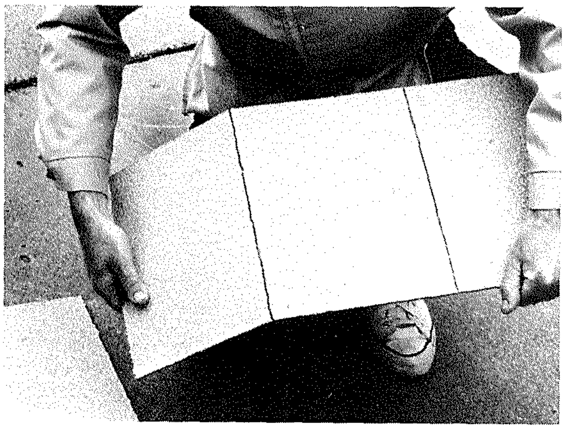
ROOFING TOOLS (top) are few, may now be in your toolbox: square, chalkline, 50-ft. tape, hammer, utility knife and putty knife. Materials (center) are shingles, roof cement and roll roofing. The correct way to walk on a pitched roof (shown directly above) is with weight concentrated on the edge of feet toward the down side. Rubber-soled shoes are essential.



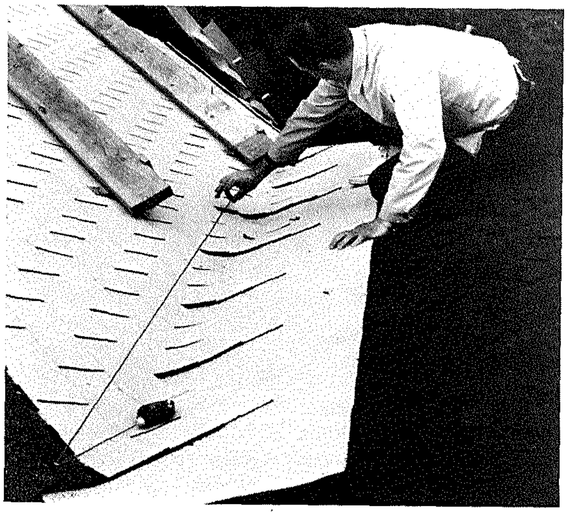


TAB SHINGLES are always applied so that the full tab is centered over a slot below. If length of the roof requires a narrow piece to finish the first course, start the second row with a piece of the same width. Then continue alternating narrow pieces in each succeeding row all the way to the ridge of the roof.

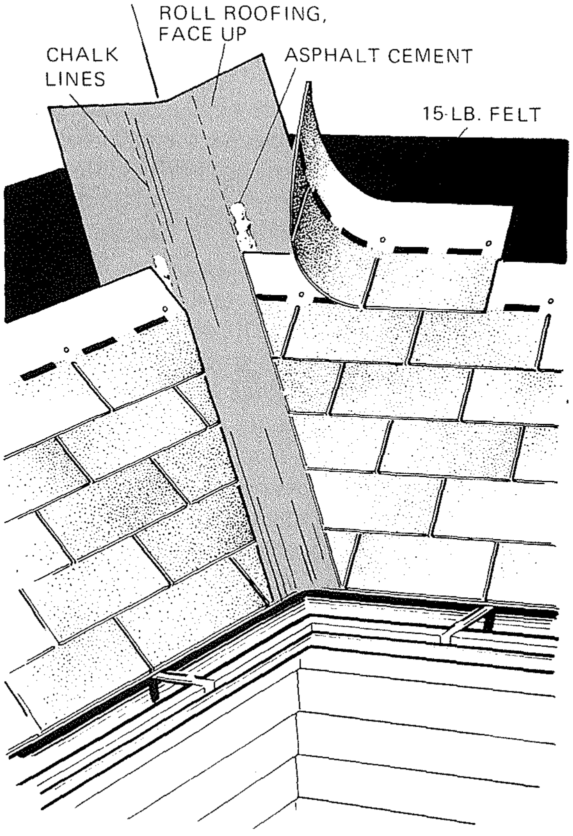
VALLEY TREATMENT



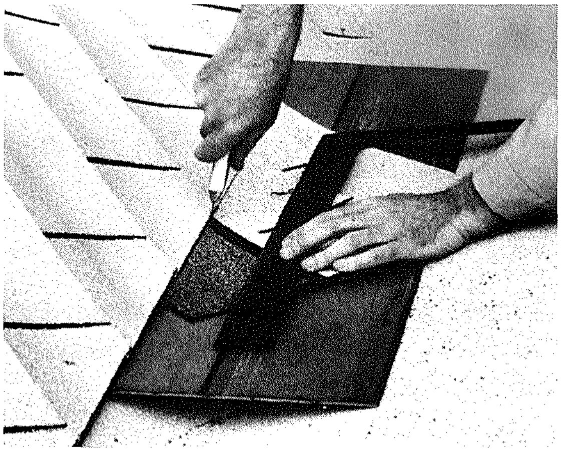
TO CUT an asphalt shingle, score a line with your utility knife, then bend and snap off the piece.



A TYPICAL open valley goes quickly if you use a chalkline to determine the exact angle cutoffs on shingles.



OPEN VALLEY is flashed with 38-in.-wide roll roofing before you move up the roof with the shingle courses. (Note: Some building codes require the use of metal flashing; see text). Width of the valley between courses should increase from top to the bottom. Minimum open width at the top is 4 in. between courses.



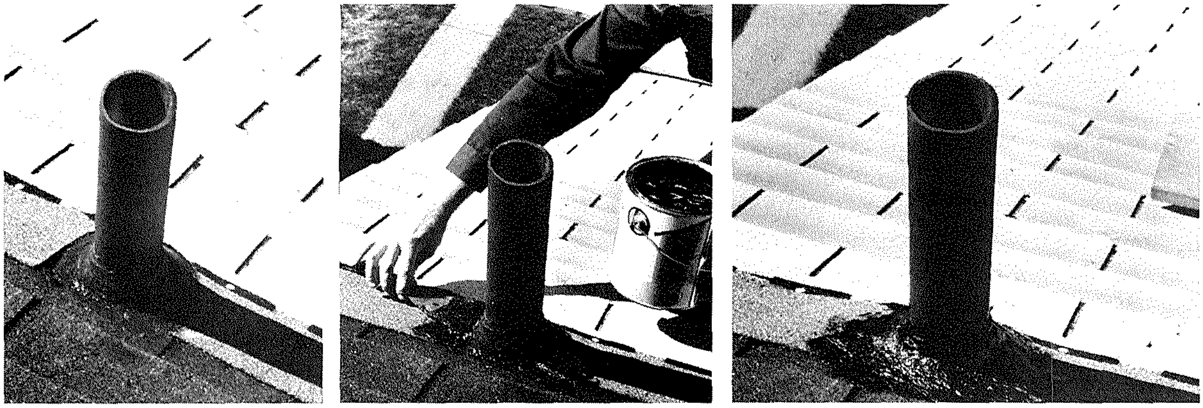
VALLEY SHINGLES are trimmed at one time using a straight-edge on the chalkline and a utility knife.

mon to use full shingles cut into thirds. These are then applied as shown in the photos. Notice that the final ridge shingle receives four nails. Make certain you seal the exposed nailheads with roof cement.

Notice that the shingles shown have adhesive patches above the tabs. These are a sealer-type shingle that will withstand greater wind and rain forces than non-sealer-type shingles. This built-in advantage makes them well worth the few extra dollars of cost.

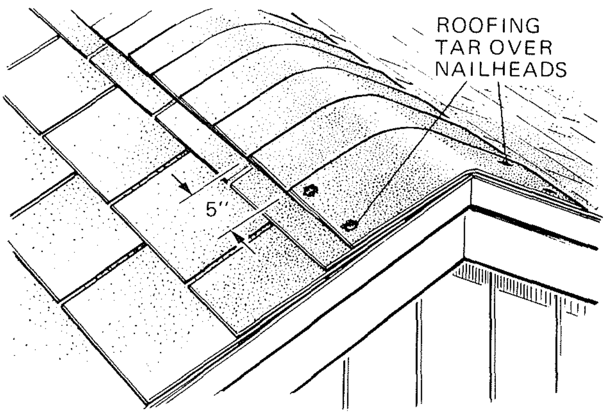
Words of caution. For maximum traction, use rubber-soled shoes or sneakers when roofing. And don't walk on the edges of the shingles because you are apt to crack them. Instead, place your feet squarely on shingle centers.

WATERPROOFING A STACK



PLASTIC ROOF cement is used to seal the joint around stack in roof. Cement is applied with a putty knife (a wood shingle will also work fine) after shingles are trimmed for a neat job. If desired, paint the cement to match.

RIDGE TREATMENT



USUAL RIDGE CAP is made up of 12-in.-sq. tabs laid with 5-in. exposure to the weather. These can be cut on the ground and carried up by the armful. Each tab is applied with two nails—except for the last shingle. Here, four nails are used and the exposed heads are then waterproofed with dabs of cement.

Reroof with wood shakes and shingles

By WAYNE C. LECKEY

Whether you want to switch to the distinctive look of hand split shakes or desire simply to re-cover the wood shingles that are already on your roof, either job is relatively easy if you know what you're doing. Here's how to do the job right

MANY HOMEOWNERS still prefer the rustic, colonial beauty of a wood-shingle roof in preference to asphalt, and if your home has such a roof which needs reshingling with either red-cedar shakes or shingles, a little know-how is all it takes for you to do the job yourself with professional results. You can end up saving yourself a lot of money and have a handsome finished product.

Called the aristocrat of roofing materials, handsplit cedar shakes make a luxurious roof of unsurpassed durability that will actually outlast the house itself. Shakes may be applied directly over the old roof if it's not slate, tile or "asbestos." Where the old roof is to remain, 6-in. strips of the old roofing are removed along the eaves and gables, and replaced with 1x6 boards before the shakes are laid. These boards provide a strong base at the perimeter, concealing the old roof from view.

Over-roofing, of course, has a number of advantages. It gives extra insulation. You don't have to worry about sudden rains while applying the shingles, and there's a lot less litter to pick up from the lawn and shrubs. But where you might be fixing up an old dilapidated house with a beyond-saving shingle roof, you have no recourse but to strip the roof and start from scratch. You have a choice of three kinds of shakes.

SEE ALSO
Gutters and downspouts . . . House additions . . . Ladders . . . Scaffolding . . . Sheathing . . . Siding

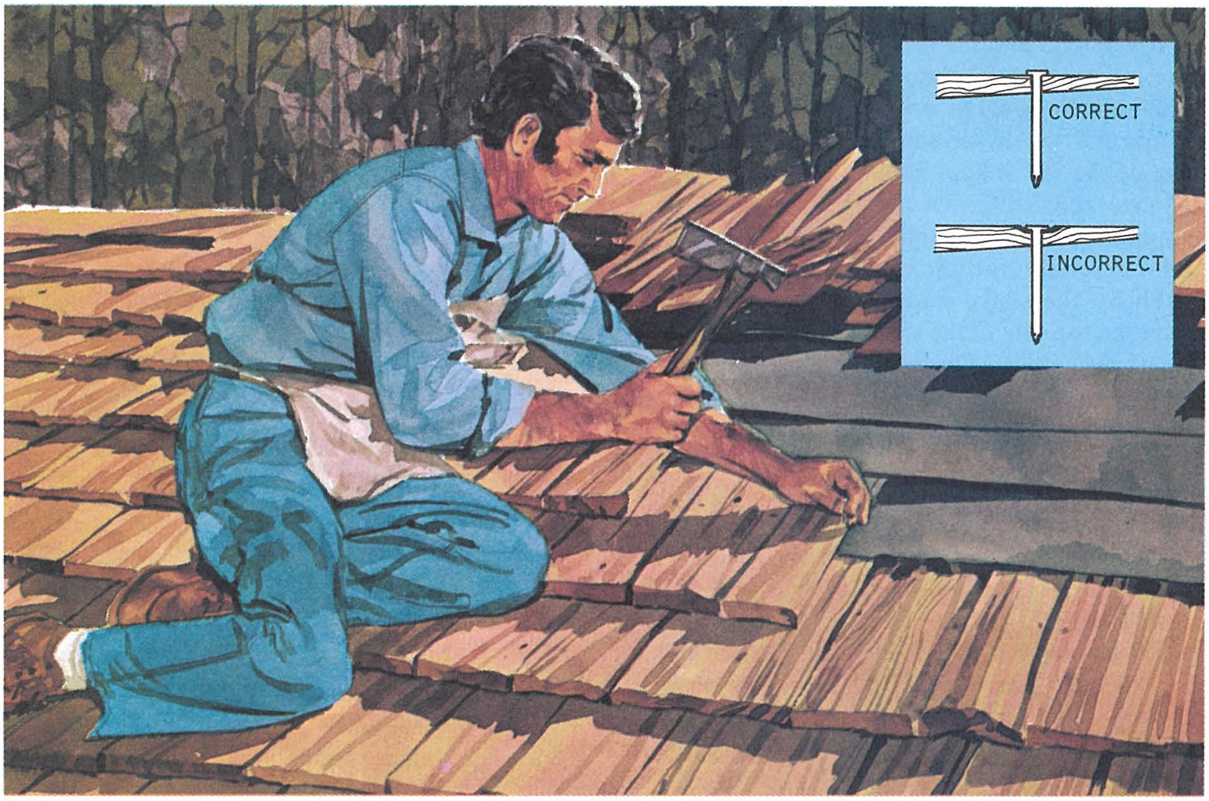
- *Handsplit and resawn shakes* have split faces and sawn backs. After cedar logs are cut into the desired length, blanks of proper thickness are split, and these then are run diagonally through a band-saw to produce two tapered shakes from each blank.
- *Tapersplit shakes* are produced entirely by hand, using a sharp-bladed knife called a froe and a wooden mallet. A natural shinglelike taper, from butt to tip, is achieved by reversing the block, end for end, with each split.
- *Straightsplit or barn shakes* are made in the same manner as taper-split shakes, except that the splitting is done from one end of the block only. This produces shakes which are the same thickness throughout.

applying shakes

Shakes can be applied over open or solid sheathing, although in areas where wind-driven snow is encountered, solid sheathing is recom-

MAXIMUM EXPOSURE FOR WOOD SHAKES

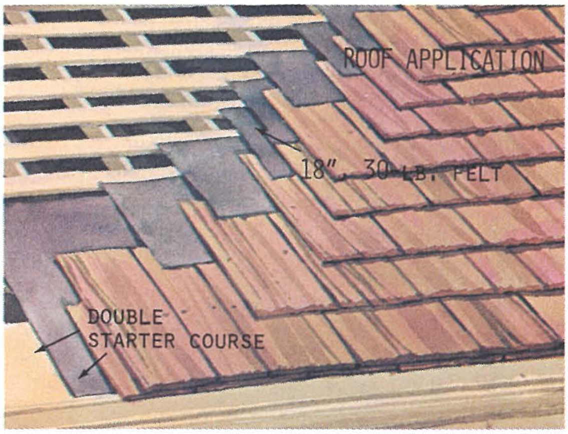
TYPE	THICKNESS	LENGTH	DOUBLE COVERAGE	TRIPLE COVERAGE
Handsplit and resawn shakes	½ to ¾″ ½ to ¾″ ¾ to 1¼″	18″ 24″ 32″	8½″ 10″ 13″	5½″ 7½″ 10″
Tapersplit shakes	½ to ⅝″	24″	10″	7½″
Straightsplit shakes	⅜″ ⅜″	18″ 24″		5½″ 7½″

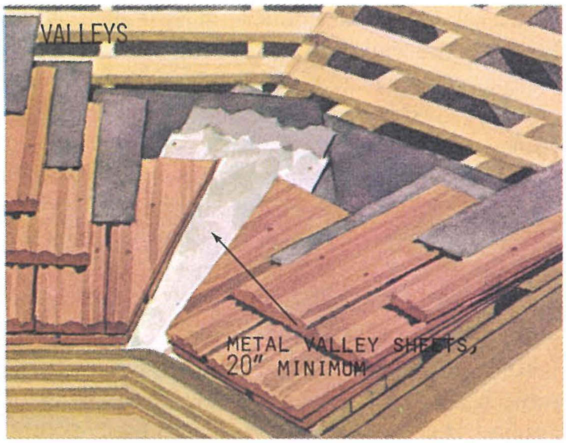


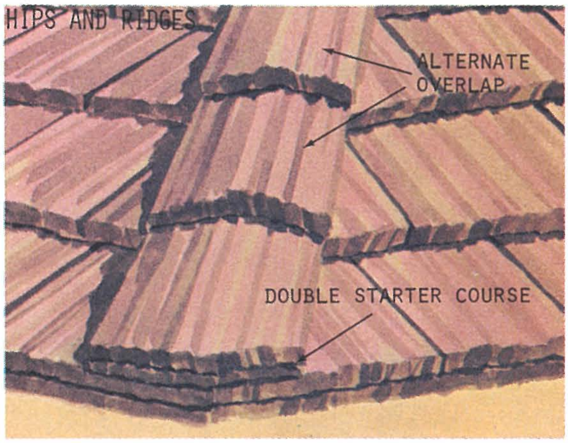
TRY TO drive nails flush with shingle's surface but not so hard that the nailheads will crush the wood.

mended. For good drainage, the pitch (slope) of your roof should not be less than one-sixth, or 4-in-12 (4 in. vertical rise for each 12-in. horizontal run). The correct weather exposure is important too, and the chart gives the maximum exposure for standard 18, 24 and 32-in. shakes, in double and triple coverages. Note that the ⅜ x 24-in. shakes should be applied at 7½-in. exposure when the roof pitch is less than 8-in-12.

To begin, a 36-in.-wide strip of 30-lb. roofing felt is laid over the sheathing boards at the eave line. The starter course of shakes is doubled, the bottom course being 15 or 18-in. shakes ex-







pressly made for the purpose. Wood shakes should extend 1 to 1½ in. out over the eave and rake to form a drip. After each course is completed, an 18-in.-wide strip of felt is placed over the top portion of the shakes. Here the bottom edge of the felt is kept above the shake butts a distance equal to twice the weather exposure. For example, if 24-in. shakes are being laid at a 10-in. exposure, the felt should be positioned 20 in. above the shake butts. The strip will then cover the top 4 in. of the shakes and extend 14 in. onto the sheathing. The individual shakes should be spaced ¼ to ⅜ in. to allow for possible expansion, and the joint offset at least 1½ in. in adjacent courses.

Fasten each shake with just two nails and use only rust-resistant nails (hot-dipped zinc or aluminum) driven 1 in. from each edge and 1 or 2 in. above the butt line of the course to follow. A 2-in. (6-penny) nail normally is adequate, but longer nails should be used when shake thickness dictates. Drive the nails until the heads meet the shake surface but *no further*; nails have less holding power when the heads are driven into the shake.

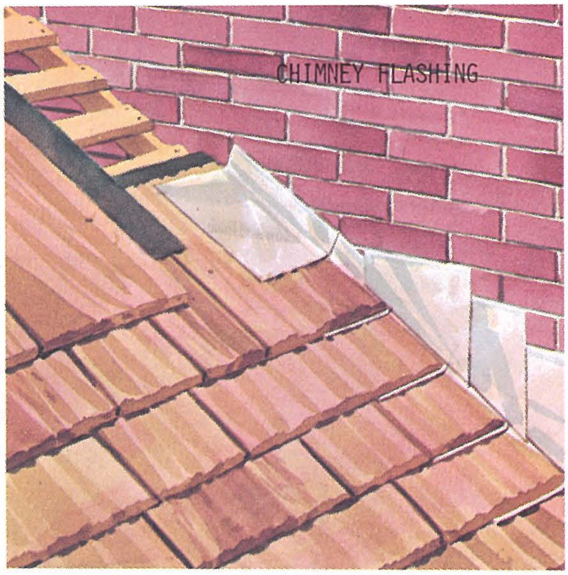
MAXIMUM EXPOSURE FOR WOOD SHINGLES

ROOF SLOPE	SHINGLE LENGTHS		
	16″	18″	24″
5 in 12 or steeper	5″	5½″	7½″
4 in 12	4½″	5″	6¾″
3 in 12	3¾″	4¼″	5¾″

NAIL SIZES RECOMMENDED

SIZE	LENGTH	GAUGE	HEAD	SHINGLES
3d*	1-¼″	14-½	7/32″	16 & 18″
4d*	1-½″	14	7/32″	24″
5d**	1-¾″	14	7/32″	
6d**	2″	13	7/32″	

*3d and 4d nails used for new construction
**5d and 6d nails used for reroofing



For the final course at the ridge line, uniform shakes are selected. A strip of roofing felt, at least 8 in. wide, is applied over the crown of all hips and ridges and shakes approximately 6-in. wide are sorted out to cover them. Two straightedges are tacked to the roof, 5 in. each side of the center line of the hip.

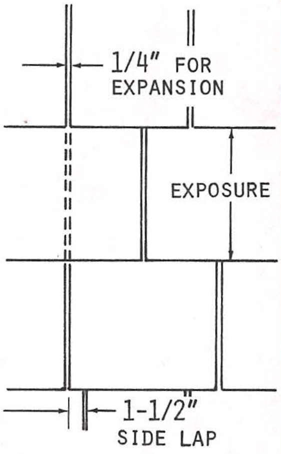
The bottom course of hip shakes is doubled and the butts are trimmed to align with the starting courses at the eaves. The first hip shake is nailed in place with one edge resting against the guide strip. Then the portion projecting over the center of the hip is cut back on a bevel. The shake on the opposite side is then applied and its projecting edge is cut back to fit. Shakes in following courses are applied alternately in reverse order. Weather exposure of the hip shakes should be the same as that for the roof shakes.

All valleys should be underlaid with 30-lb. roofing felt applied over the sheathing. The metal valley sheets should be at least 20 in. wide. Edges of the shakes are cut to run parallel up the valleys, approximately 5 in. apart. Base and chimney flashing units are laid with each shake course and counterflashed.

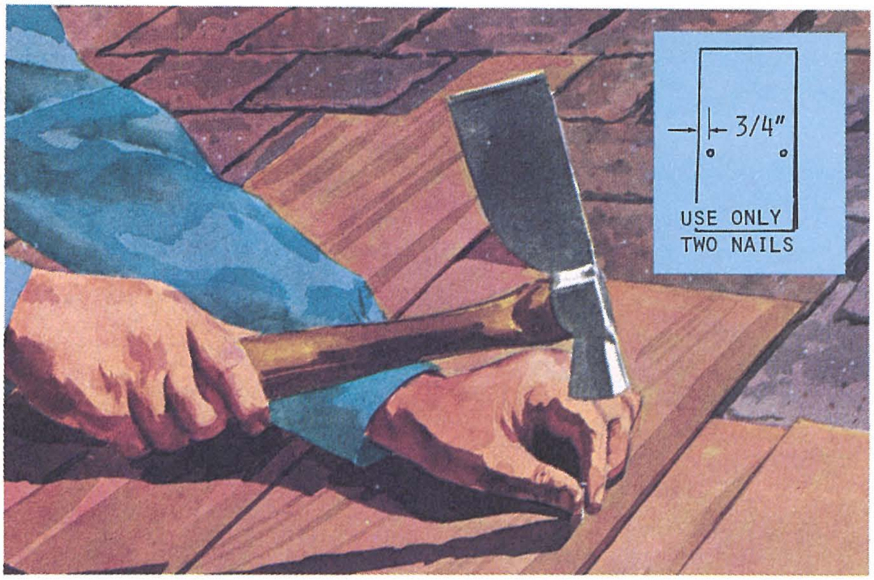
An adjustable exposure gauge on the edge of a shingler's hatchet speeds application in making it easy to measure correct exposure and run the courses straight.

applying red-cedar shingles

Red-cedar shingles are applied in much the same manner as shakes. Where they are to be applied over an old roof of wood or asphalt shin-



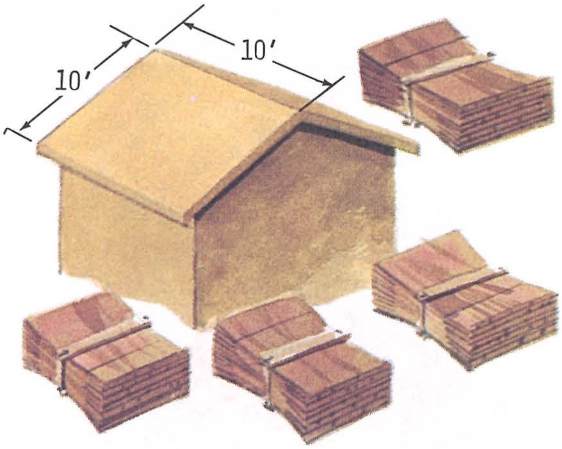
SPACING and location of shingle joints is important to allow for expansion and guarantee a nonleaking job.



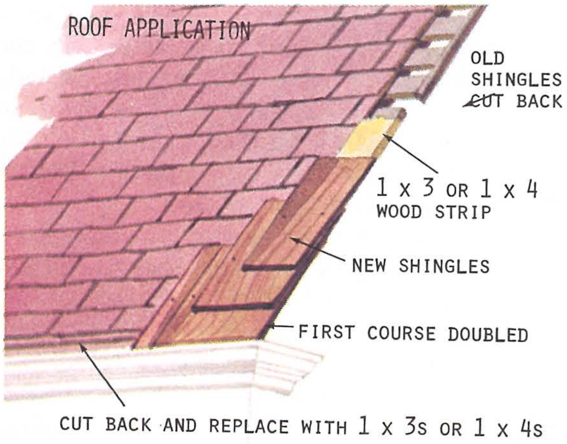
ONLY TWO NAILS are used per shingle and are placed so they are ¾ in. above butts of following course.

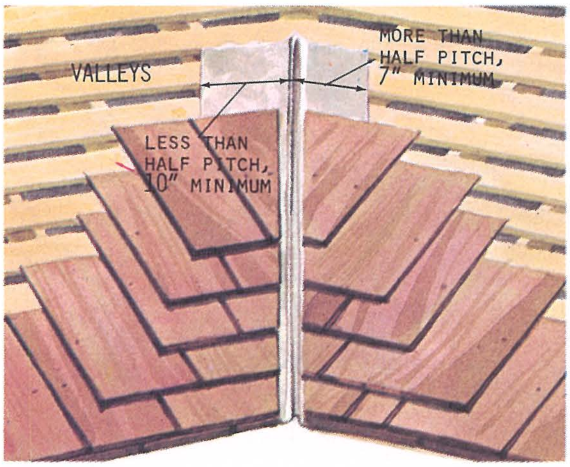
gles, roof preparation is the same along the eaves and gables. In addition, a strip of lumber is laid in each valley to separate the old metal valley from the new, and the old ridge shingles are replaced with strips of beveled cedar siding, thin edge downward.

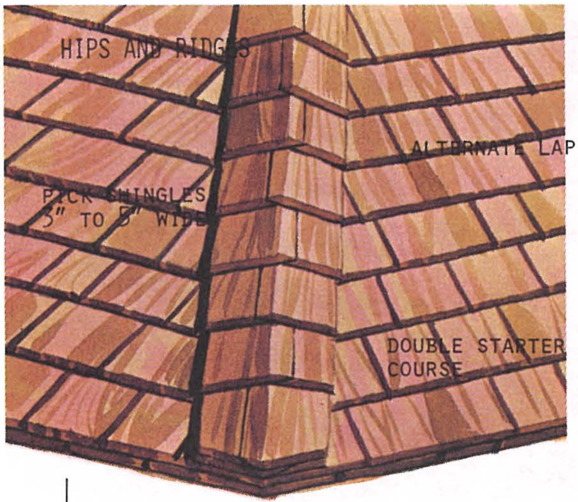
Normally, cedar shingles are applied in straight single courses, using a straightedge to keep the rows straight and true. On roof slopes of 5-in-12 and steeper, standard exposures are: 5 in. for 16-in. shingles, 5½ in. for 18-in. shingles and 7½ in. for 24 in. shingles. If the roof pitch is less than 3-in-12, cedar shingles are not recommended.

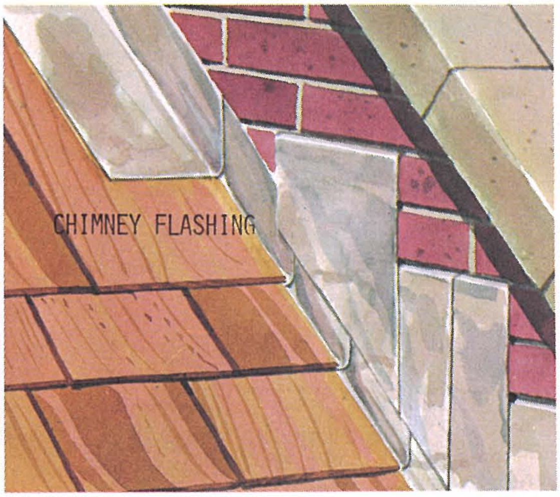


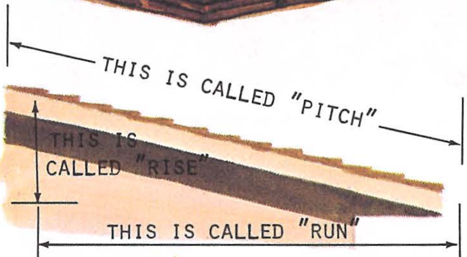
TO ESTIMATE the number of shingles need for your roof, four bundles, which are called a "square," will normally cover 100 square feet of roof area.

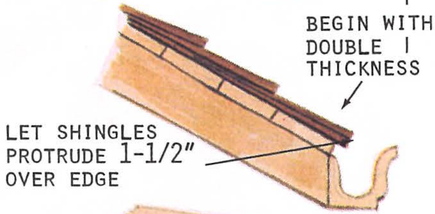


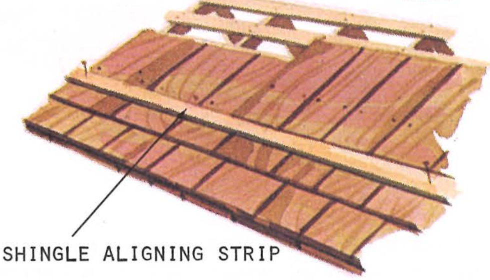

VALLEYS
MORE THAN HALF PITCH, 7" MINIMUM
LESS THAN HALF PITCH, 10" MINIMUM

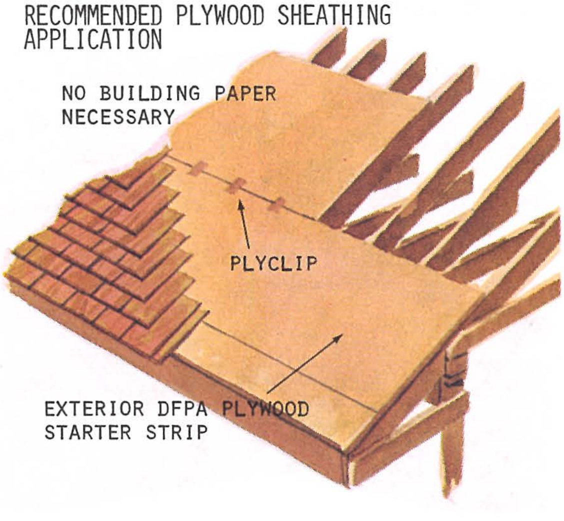







BEGIN WITH DOUBLE THICKNESS
LET SHINGLES PROTRUDE 1-1/2" OVER EDGE




RECOMMENDED PLYWOOD SHEATHING APPLICATION
NO BUILDING PAPER NECESSARY
PLYCLIP
EXTERIOR DFPA PLYWOOD
STARTER STRIP

Like shakes, cedar shingles are doubled along the eaves, and the butts of the first course are laid so they hang over the edge 1½ in. to insure proper rain spillage in the gutters.

Space the shingles ¼ in. apart and never have two joints in line if separated by only one course of shingles. Leave a side-lap of 1½ in. between joints in successive courses. Use only two nails per shingle, ¾ in. in from each edge, and locate them so the next course will cover the nails by at least ¾ in. The chart specifies the right size of nail to use. As with shakes, the use of rust-resistant nails is most important. Drive the nails flush, but not so hard the nailheads crush the wood.

Hips and ridges are capped with factory-assembled units lapped to provide the same exposure as in the roof proper.

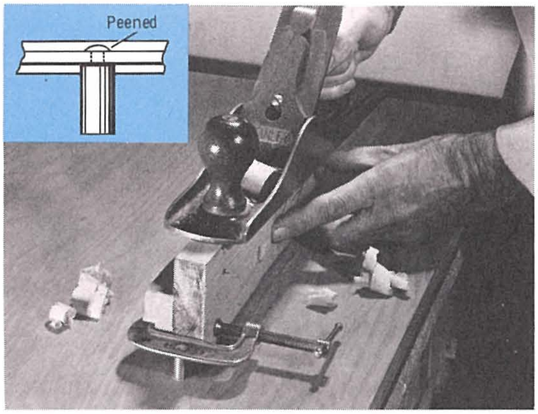
estimating squares

A "square" of shingles consists of four bundles, so called because they normally will cover 100 square feet of roof area.

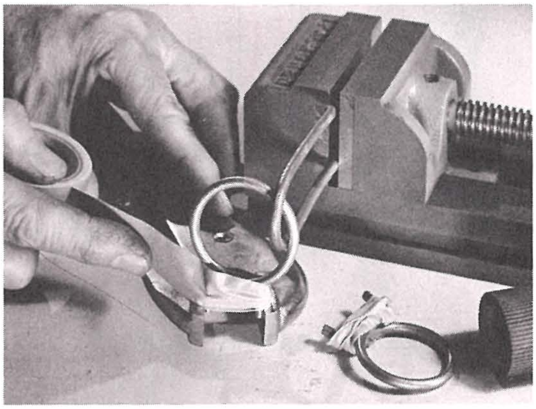
To estimate the number of squares you'll have to order for your roof, first determine the square-foot ground area of your house (include eave and cornice overhang). Increase this total square-foot area by 8½ percent if the roof pitch is 5 in 12, 12 percent if it's 6 in 12 or 20 percent if 8 in 12. Then divide total by 100.

Where pitch is less than 5 in 12, allow for a third more shingles to compensate for the reduced exposure. And, add a square for each 100 lineal feet of hips and valleys. As for nails, figure 2½ lbs. per 100 sq. ft. of roof area.

Before you get on any roof, slip on a pair of sneakers. They'll not only give you good footing, but they'll keep from marking up your new roof.

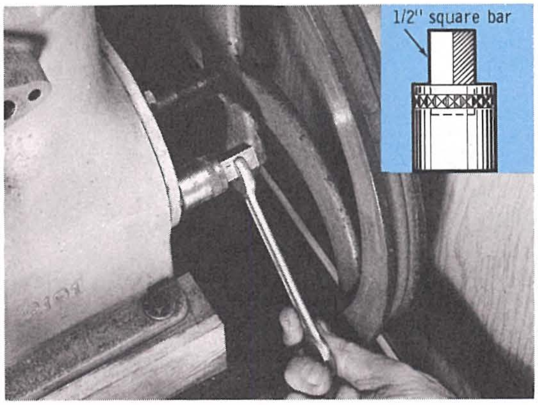


PEEN A LENGTH OF PIPE or heavy rod at right angles to a C-clamp frame and you have a handy workbench vise. Simply drop the stud projection in a hole drilled in the top of the bench, insert the work and tighten the clamp. You could also drill and tap a hole in the end of the rod, drill a hole through the clamp and attach the rod with a screw.—*Clarence Preitenfeldt.*



WITHOUT SPECIAL PLIERS, spring-steel hose clamps can be the hardest things to hold open when they're being installed. Invariably they'll twist and fly off the jaws of common pliers. After having this happen several times, I hit upon the idea of using tape to hold them open. This made it easy to place the clamps over the hose and to release them by simply cutting the tape. As a safety precaution, a wire yoke (see photo) will keep the clamp in tow while it's bound with tape.—*Daniel Boucha.*

THERE ARE ANY NUMBER of ways to keep the rim of a paint can free of paint, including the stunt of making nail holes in it for the paint to drain back into the can. However, perhaps the simplest way of all is to crowd aluminum foil into the can rim as soon as the cover is removed. Then, no matter how much paint spills over the rim, you simply pull out the foil when you're ready to quit. The rim will be clean as a whistle and the cover will fit as tight as it did originally.—*Ken Patterson.*



A USEFUL ACCESSORY for a ½-in. socket wrench is a ½-in.-square steel bar that's been cut into six or seven various lengths. When you need to tighten or remove a bolt in a cramped or awkward-to-reach area, just insert a suitable bar in the socket and use an open-end box wrench to turn the bar, socket and bolt. It's practically the only way to get into tight quarters where a ratchet, crossbar or universal-type extension won't fit (e.g., removing a VW fuel pump).—*H. G. Bennett.*

How to prevent roof ice dams

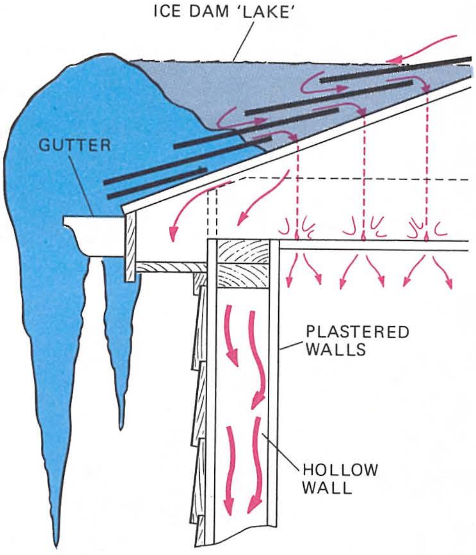
DRIFTING SNOW on a roof makes a pretty picture but it can wind up as water inside your home. How is this possible? Unless removed, mounds of snow along the roof gutters will alternately thaw and freeze over a period of sunny days and cold nights, resulting in the formation of a dam of ice and a pool of water. With gutters clogged with ice, melted snow trickling down the roof forms a puddle. With no other place to go, the water starts to back up between the shingles, leak into the attic and finally drip through the ceiling.

Once started, an ice dam builds up rapidly and the water often will flow over the dam to form huge icicles.

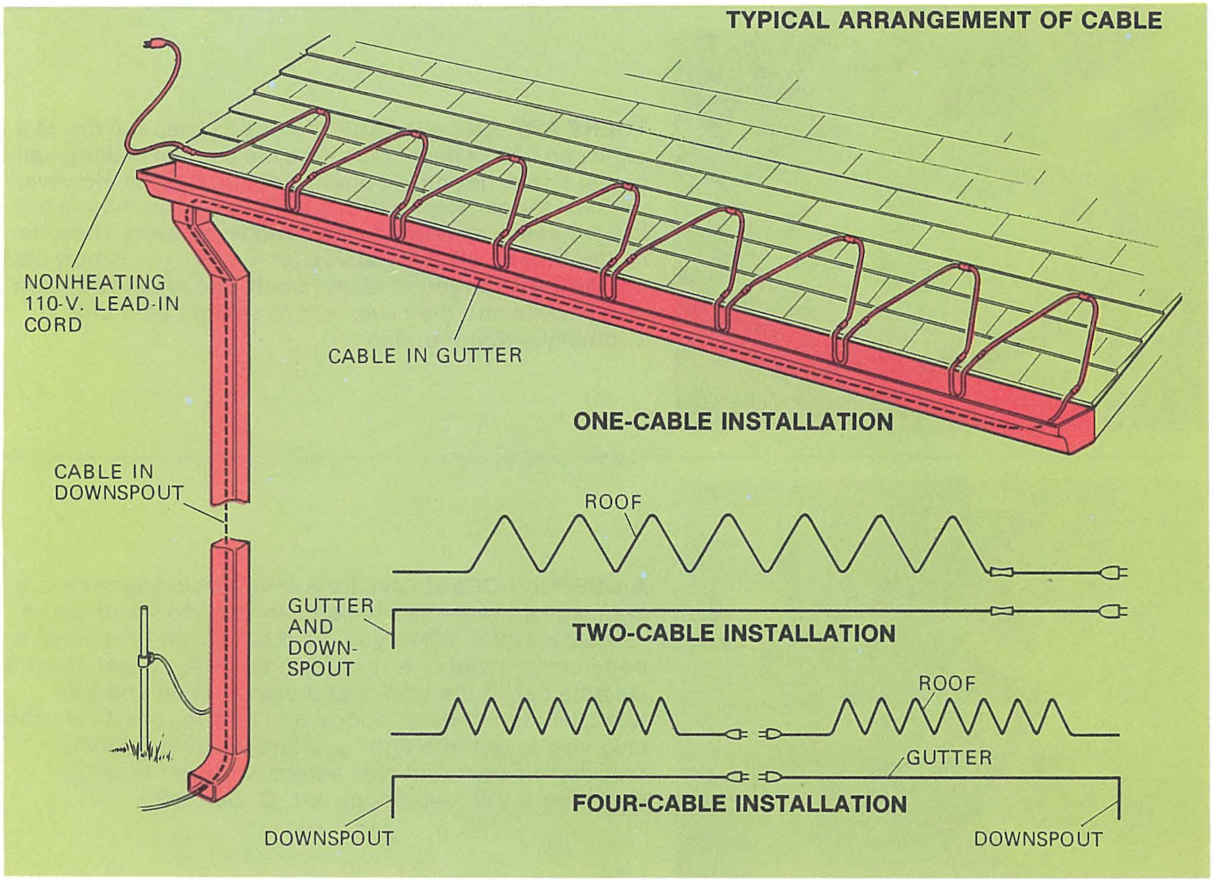
Low-pitch roofs are more prone to ice dams than steep roofs, and homes with roofs having

SEE ALSO

Drainage, downspout . . . Gutters and downspouts . . . Home winterizing . . . House additions



HOW ICE DAM CAUSES LEAKS


TYPICAL ARRANGEMENT OF CABLE

ONE-CABLE INSTALLATION

TWO-CABLE INSTALLATION

FOUR-CABLE INSTALLATION

little or no overhang are subject to greater interior leakage. But if weather conditions are right, ice-clogged gutters can be a problem on all roofs.

The simplest solution would be to clear snow accumulations from the roof as they form, but no one in his right mind is going to get up on a slippery roof in winter. The safest and most practical solution is to install electric heating cables. They produce just enough heat to prevent ice from forming and can be turned off when not needed. Some are controlled by a thermostat which turns the cable on when the temperature dips to 40°F. They're installed in the gutters and along the "cold" edge of the roof where interior heat loss is less, and you can buy them in lengths of 20 to 200 ft. for 120-v. or 240-v. circuits. Electrical consumption ranges from 160 w. to 1650 w. depending on the size cable used.

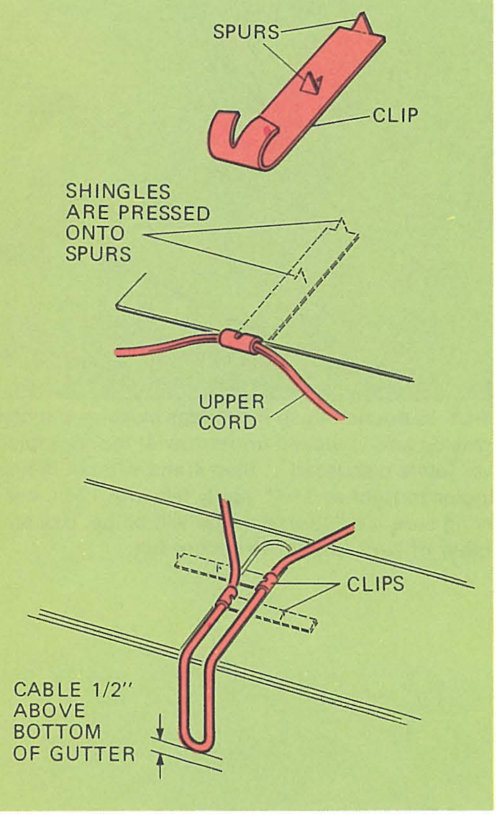
The best time to install heating cables is during warm weather, of course, but where it has to be done during freezing weather the cable should first be unrolled on the ground and plugged in to allow it to warm up. This will make it more pliable and easier to install.

Heating cables are mounted with special clips zigzag fashion along lower edges of the roof. Clips must be pushed up under the shingles and then the shingles are pressed down so that tiny spurs in the clips will embed. Exposed ends of the clips have hooks to hold the cable. Clips can be attached to slate roofs with thick roofing compound.

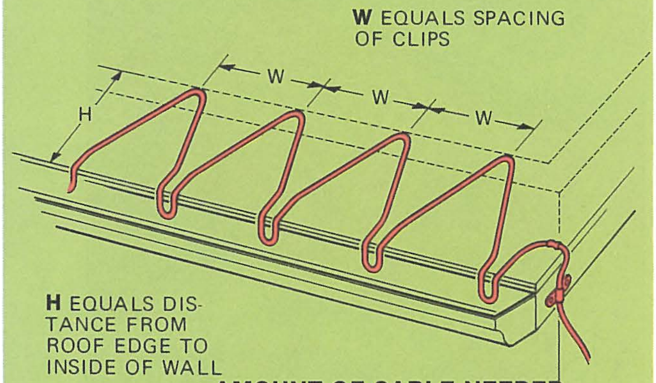
The cable should project down past the edge of the roof, forming loops that dip into the gutter to within ½ in. of the bottom. Do not cross or overlap the cable, nor space it closer than ½ in. Use two clips to assure the right spacing where the cable loops into the gutter.

Once the electric heating cable is in place, the lead-in can be plugged into an outdoor receptacle on a properly fused circuit that won't be overloaded by the cable's power needs. Gutter and downspout should be grounded to a water pipe or rod.

HOW CLIPS HOLD CABLE


SPURS
CLIP
SHINGLES ARE PRESSED ONTO SPURS
UPPER CORD
CLIPS
CABLE 1/2" ABOVE BOTTOM OF GUTTER

SPACING OF CABLE


W EQUALS SPACING OF CLIPS
W
W
W
H
H EQUALS DISTANCE FROM ROOF EDGE TO INSIDE OF WALL

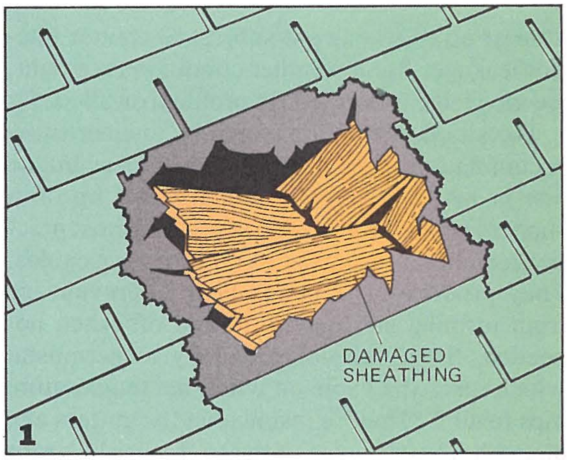
AMOUNT OF CABLE NEEDED

SNOWFALL	H. (in.)	CABLE LENGTH (ft.)
Light W = 24 in.	12 24 36	2.8 3.6 4.5
Medium W = 12 in.	12 24 36	3.8 5.6 7.0
Heavy W = 6 in.	12 24 36	6.0 10.0 14.0

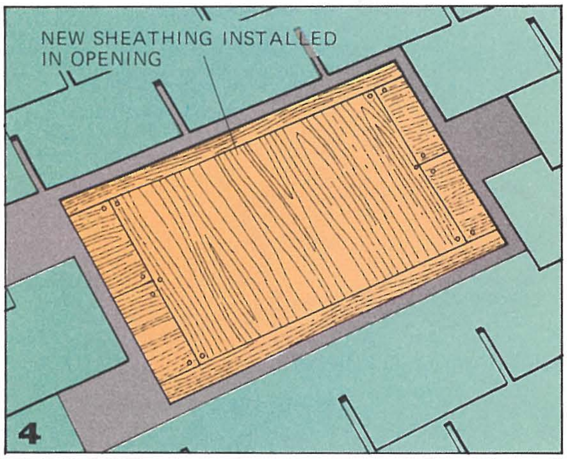
How to repair a damaged roof

HIGH WINDS and heavy rains are never welcomed by homeowners. When such storms strike, most of us consider ourselves lucky if damage to the house and property is minor. Unfortunately, very often the damage is up on the roof. Shingles that have been exposed to weather for 10 years or more are particularly susceptible to being blown off. (However, the self-seal, tab-type shingles, which have been around a while, have reduced the incidence of this type of damage considerably.) Of far greater concern is what to do when your roof—not just the shingles—has been damaged by a toppled tree or fallen limb.

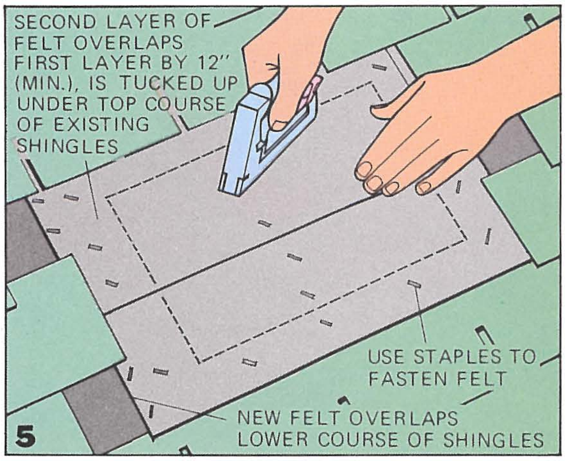
If you are afraid of height and working from a ladder, don't fight the feeling: Call in a pro. But if you do the repair work yourself, be advised it is a must to thoroughly cut out all the damaged area and replace with sound material. New sheathing must be of the same thickness as the existing, and all joints must be properly covered with 15-lb. felt. Weaving-in of shingles is a must or the patched-in area will leak.



SEVERE ROOF DAMAGE, such as shattered sheathing shown here, can be caused by falling limbs. Sheathing problems can also result from leakage, which rots sheathing. Rot damage is often not apparent. If you spot a bulge under the shingles, chances are the sheathing needs replacing. Inspect the area from inside where possible.


NEW SHEATHING INSTALLED IN OPENING
4

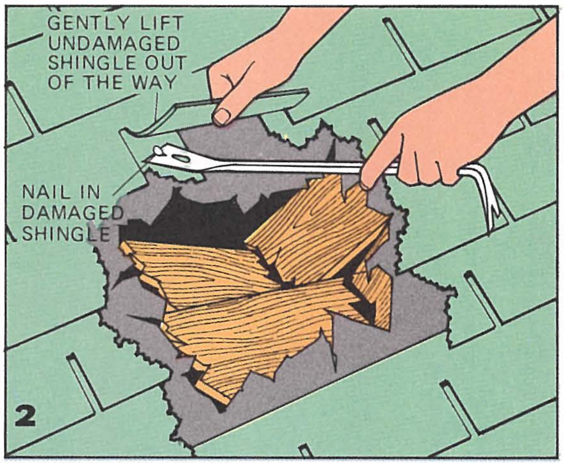
USE EITHER 1x6 tongue-and-groove roofers or plywood as shown, but it must be same thickness as existing sheathing. Plywood goes faster because it requires cutting just one piece (for a small hole). Next, cut 8-in.-wide felt strips and cover joints. Do bottom horizontal first, then the verticals and top horizontal; use overlaps.


SECOND LAYER OF FELT OVERLAPS FIRST LAYER BY 12" (MIN.), IS TUCKED UP UNDER TOP COURSE OF EXISTING SHINGLES
USE STAPLES TO FASTEN FELT
NEW FELT OVERLAPS LOWER COURSE OF SHINGLES
5

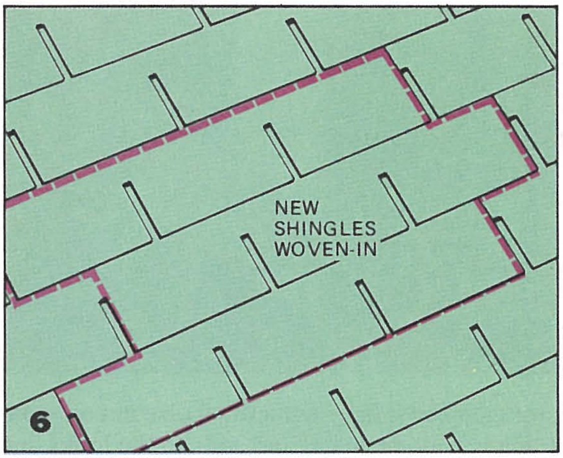
APPLY 15-pound felt so it overlaps existing shingles on downside and is tucked under row at top. Completely cover joints discussed in Step 4 and slip felt beneath shingles to right and left. Apply felt with 12-in. overlap, making sure it's flat or shingles will bulge. Use ample number of ¼-in. staples to secure felt.

SEE ALSO

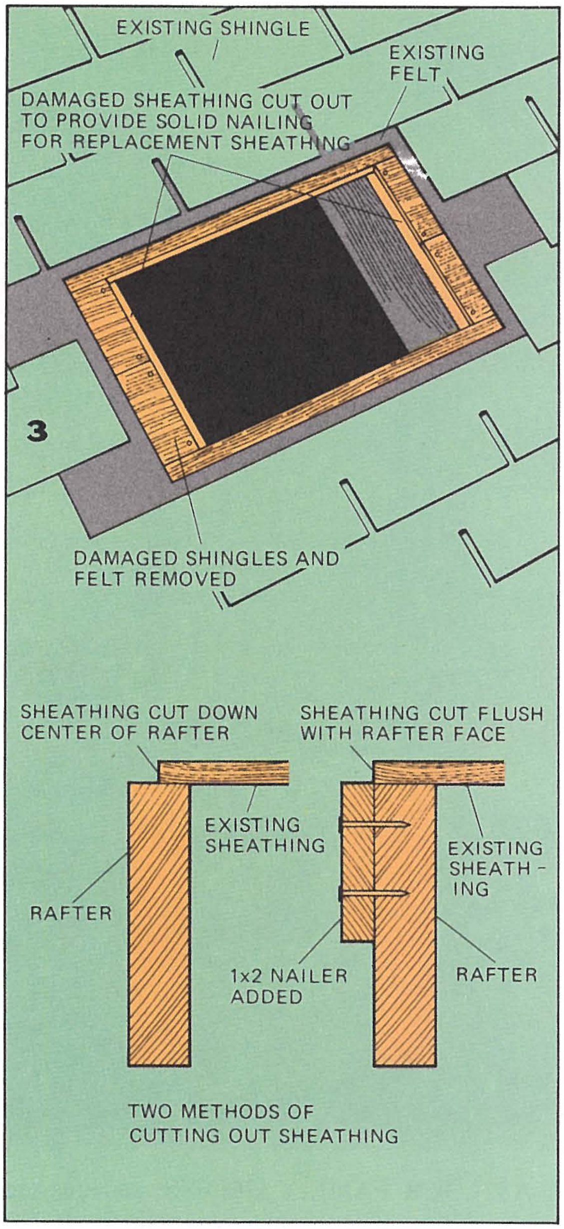
Gutters and downspouts . . . House additions . . . Ladders . . . Scaffolding . . . Sheathing . . . Siding


GENTLY LIFT UNDAMAGED SHINGLE OUT OF THE WAY
NAIL IN DAMAGED SHINGLE
2

DAMAGED SHINGLES and tarpaper (felt) must be entirely—and cleanly—removed. Completely remove any partially damaged shingle so you can weave in a replacement shingle. Start with top course and work down. Use a ripping bar or large screwdriver to pry up nails from damaged shingle, or tear out shingle and drive nails home.

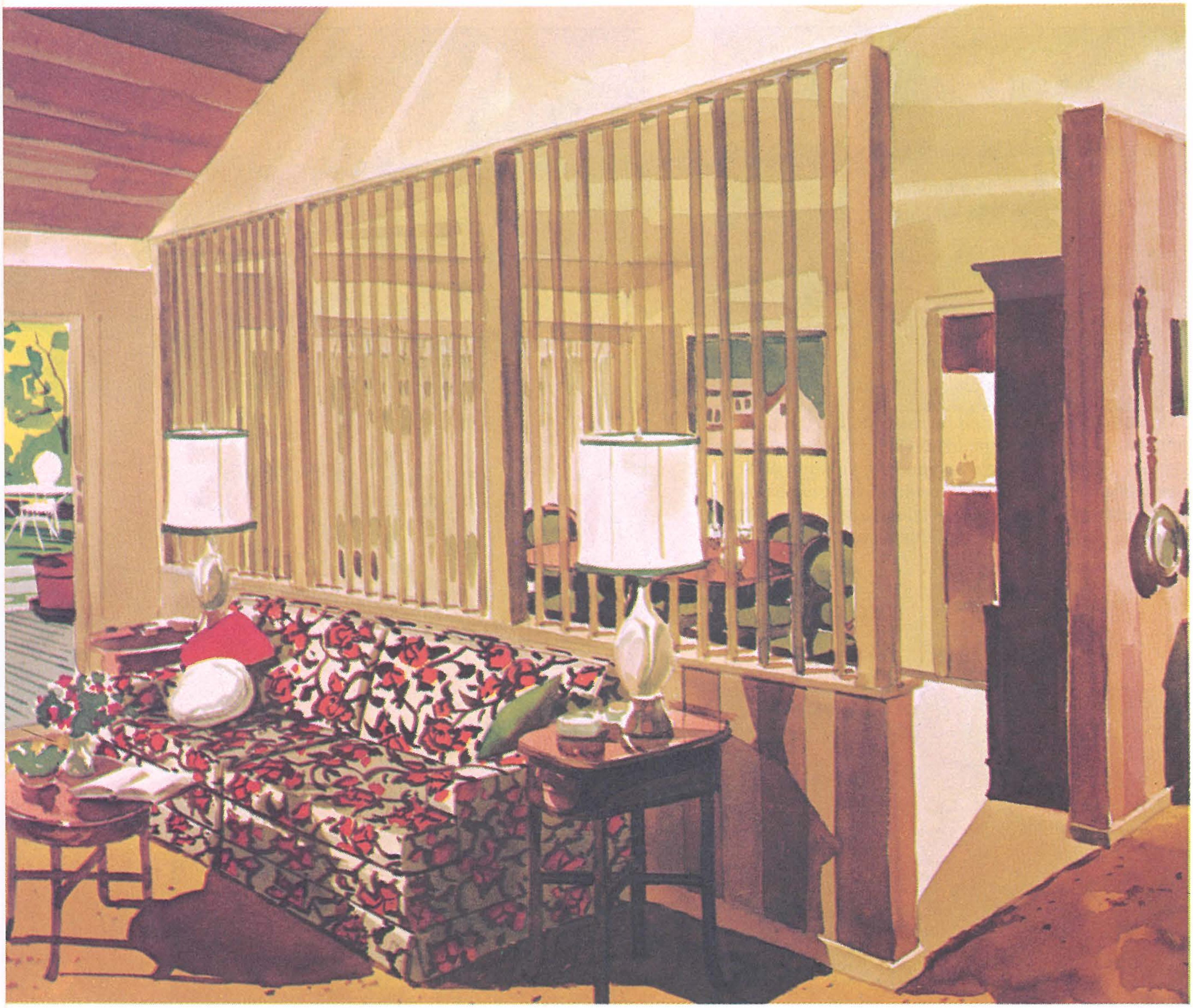


WEAVE NEW SHINGLES into existing ones so alternate rows overlap. *Never have an unbroken vertical line (shingle joint).* Here, for clarity, new shingles are shown slightly lighter than the existing. On repair jobs, take a piece of old shingle when you buy the new. Try to match so your repair job will be virtually invisible.


EXISTING SHINGLE
EXISTING FELT
DAMAGED SHEATHING CUT OUT TO PROVIDE SOLID NAILING FOR REPLACEMENT SHEATHING
3
DAMAGED SHINGLES AND FELT REMOVED
SHEATHING CUT DOWN CENTER OF RAFTER
SHEATHING CUT FLUSH WITH RAFTER FACE
EXISTING SHEATHING
RAFTER
EXISTING SHEATHING
1x2 NAILER ADDED
RAFTER
TWO METHODS OF CUTTING OUT SHEATHING

NEXT, remove all damaged, split and cracked sheathing to obtain a squared, easy-to-fit opening. You need solid nailing to attach new sheathing; use either method above to cut out old. Either cut down center or a rafter or cut alongside and add a 1x2 nailer for the new sheathing to be fastened to. The latter method is easier.

Beautiful walls that serve a purpose



■ AS YOUR FAMILY GROWS, so does the accumulation of personal possessions. It becomes increasingly clear that the more square feet of living space in your home you can utilize efficiently, the greater your family comfort will be. A logical, and frequently the most economical, place to turn to for desperately needed storage space is a wall. The three wall ideas shown here, in addition to satisfying particular family storage needs, have something else in common: Each is well-designed and adds to the looks and the value of the home.

The long see-through wall shown above is framed to give a deck (or counter) at a height of approximately 36 in. The deck and post enclosures are of nominal 1-in. clear pine. The cabinet on the living room side was paneled; on the opposite side narrow pine shelves were installed to hold a collection of knickknacks.

Above the deck, large dowels (closet poles) were installed to give the illusion of greater room height and size. Thus, several advantages were gained by converting a flat, run-of-the-mill wall into a customized ''room divider.''

SEE ALSO

Bookcase closets . . . Cabinet furniture . . .
Family rooms . . . Hi-fi centers . . . Modular furniture . . .
Remodeling ideas . . . Storage ideas . . .
Storage walls . . . Study centers

The unit shown at the bottom of this page was designed by a pro. The homeowners required a built-in that could be used for stereo equipment and a convenient closet for their children to store boots, mittens and so forth. Additionally, they wanted it placed near the front entrance to create an entry way.

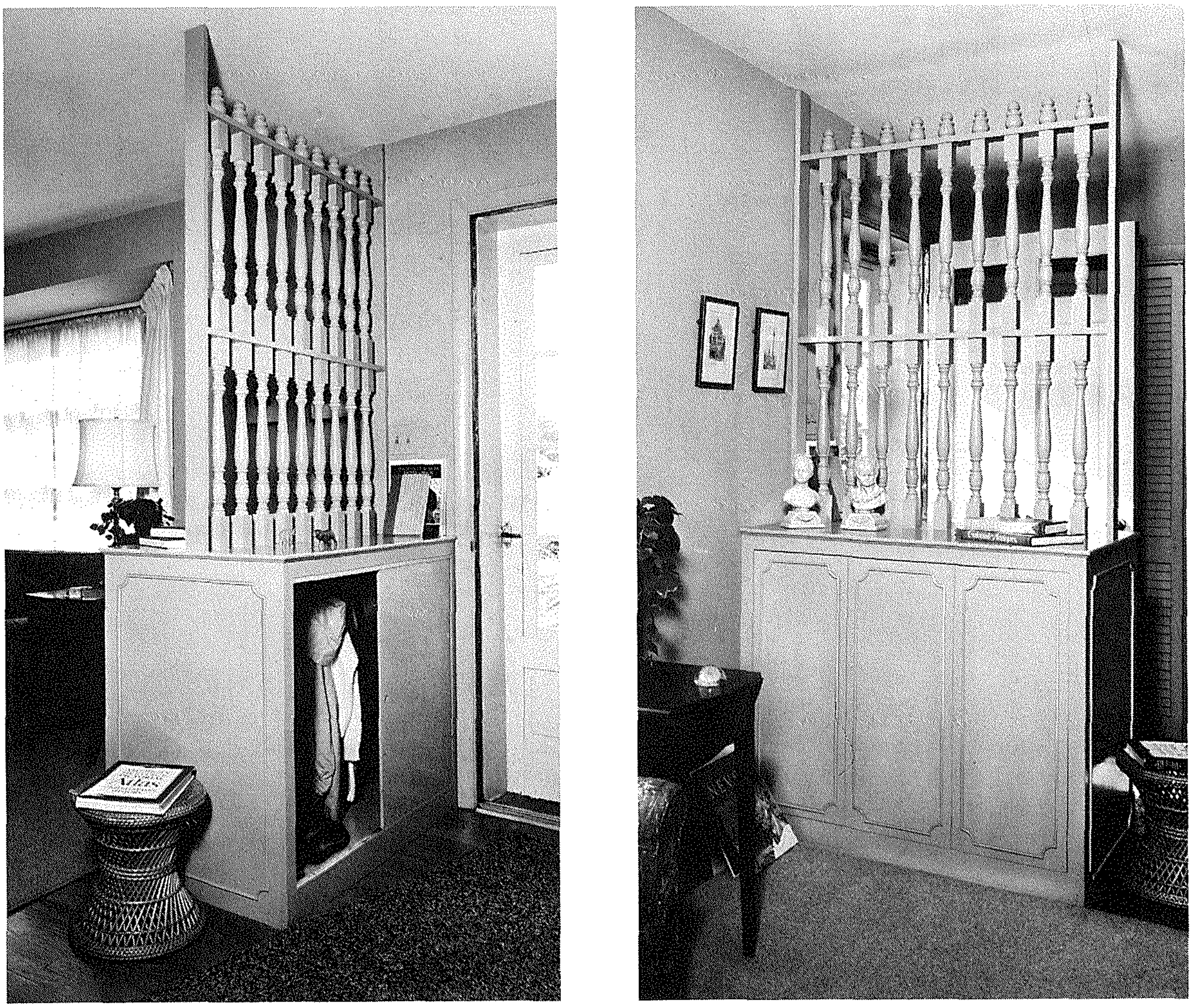
The cabinet is 27 in. wide, 39 in. high and 42 in. long. In turn, it is topped by a double-deck set of 18 hand-turned balusters (nine per row). The folding doors on the living-room side are trimmed with factory-made moldings for a decorator touch and fitted with friction catches for easy access. The interior shelves are removable; thus, should storage needs ever change, there is a built-in flexibility to meet them.

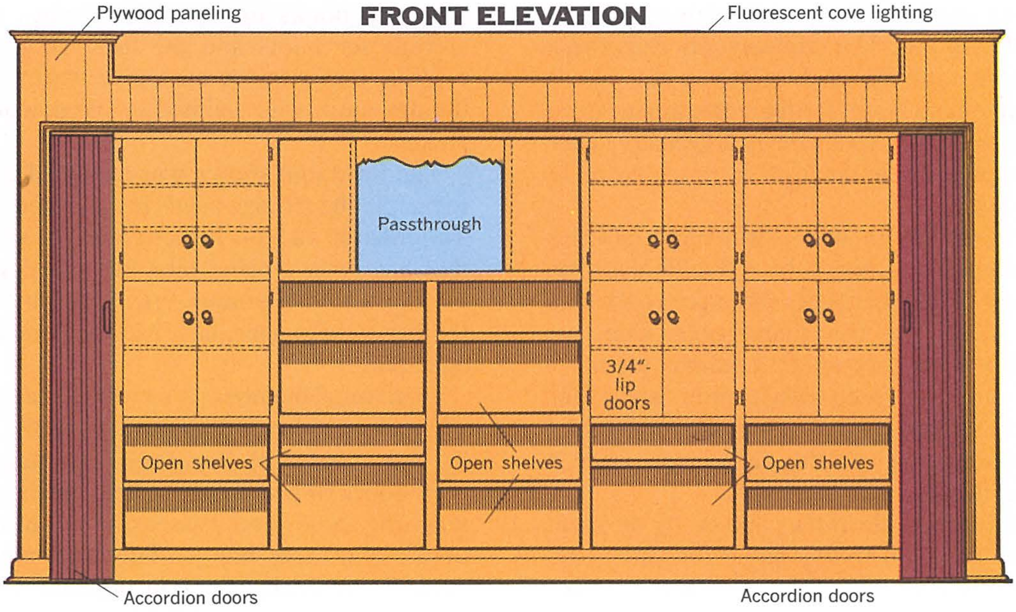
The children's side of the cabinet, by the front door, is fitted with sliding doors for quick use. Inside, there is an accordion-type wood hanger with peg hooks for small-fry clothes plus the storage for boots and the like. To match the existing decor in the room, the entire cabinet-divider unit was painted a Wedgwood blue shade.

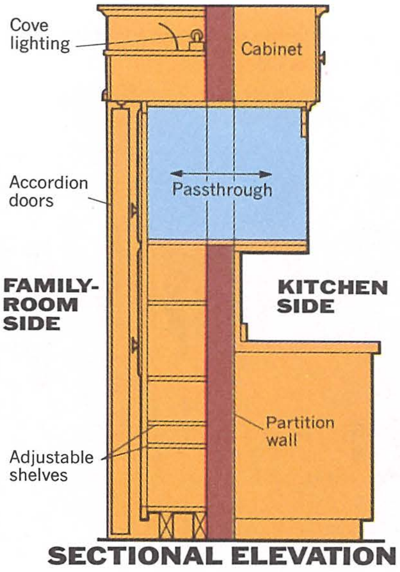
The third unit shown was designed expressly to handle the storage needs in a playroom next to a kitchen. It's a built-in along a wall, 15 feet long, that has been divided into five equal sections. Each of the five youngsters in the family, from toddler to teen-ager, has his own personal storage area.

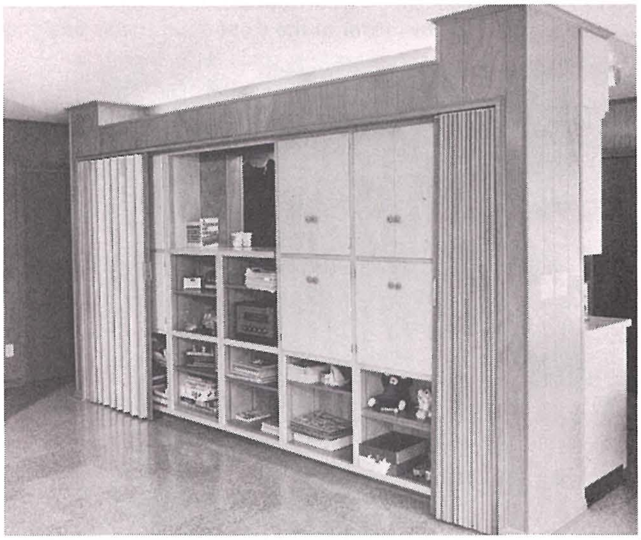
Horizontal members are spaced so as to create 13 sections (plus a pass-through to the kitchen for snack serving.). Six of the sections are fitted with doors to protect the older children's more valuable games and possessions from the little ones' inquisitive hands. The remaining lower sections are fitted with 18-in. adjustable shelves.

ENTRY WALL viewed below from both sides, provides storage area for stereo components, closet for children's wardrobe and attractive foyer at the front door. It was designed by Top Recker, A.I.D.









FULL-DEPTH wall gives ample storage required by a large family. Accordion doors hide it all when desired.

The unit shown was constructed entirely of ¾-in. plywood (except for cleats, nailers and the like). To withstand abuse, the unit was finished, inside and out, with a primer and semigloss paint.

To hide the unavoidable clutter of toys that always seems to be present on the toddler's open shelves, accordion doors were installed in front. Then, when the room is used for adult parties, the paraphernalia behind can be quickly removed from view.

If the wall is to be used primarily by adults or teen-agers, the face of the unit could be built of cabinet-grade plywood and stained for a natural finish. Another method would be to treat the facing with either ½-in. plywood or particleboard, and then glue and nail prefinished paneling over.

Noisy steam heat

My home is steam-heated and during the heating season I'm bothered with noises in the system—a popping, cracking sound that banishes sleep. This I must correct before another heating season. What's the remedy?—Frederick Mason, Albany, N.Y.

A common cause is a defect that creates a vacuum somewhere in the system, usually in a line that slopes downward toward a radiator. Have your service company check to be sure pipes are correctly installed at the boiler. Then check lines to radiators yourself with a level to detect any that slope toward the radiator (they're supposed to slope away from it). You can then raise the radiator on wood blocks to achieve the correct slant.

Stretching bar clamps

My sofa has a wood front rail, the ends of which are loose in the leg joints; I suppose the glue has failed. I have two 36-in. bar clamps and my problem is how to use them to draw the joints tight.—E. Carlos, Chicago.

If the sofa is a standard size, the clamps will have to span 6 ft. I once solved a similar problem by boring two holes in a short length of ¾-in. plywood, enlarging these to take the sliding jaws of the clamps. With these jaws hooked in the holes, you and a helper could place the clamps so the screw-actuated jaw will engage the legs, then tighten. You could draw the clamps tight enough to close the opened joints on fresh glue. Bore tiny holes in inconspicuous places at each joint and force glue into joints with a glue injector. Wipe off excess glue before it dries or it may discolor the finish. Pad clamp jaws so they don't mar the legs.

Right damper length

I plan to build my own fireplace and I have gotten "yes-and-no" answers to my question of the proper length of the damper. Is the correct installation across the full width? If not, what part of the full width?—Thomas Fell, Nashville, Tenn.

In natural fireplaces of conventional size it's common to install full-width dampers. The damper should be the full width of the smoke opening—the distance measured at the back, often called the "fireback." A damper of shorter length may tend to create turbulence in the updraft, causing the fireplace to smoke—incurably in some instances. I'm assuming your fireplace is to be built into a wall and not the projecting or two-way types. These require a different damper assembly.

Cleaning a clock face

I want to clean an old clock dial, which is soiled and discolored. How do I go about it?—E. Edmund, Oakland, Calif.

Carefully—it's risky at best. If the dial is paper on metal or wood, one way to clean it is to flood it with naphtha—*caution:* naphtha is flammable—and immediately sprinkle it with talcum powder, covering the whole surface uniformly. Wait a minute or two, then brush off the talc. If some discoloration still shows, the process may be repeated. If the dial is enamel on wood or metal, a light washing with mild soapy water, applied with a loose pad of clean cotton, is safest. Be careful not to overwet the surface. Do not use naphtha or any other solvent, as it might soften or remove old enamel.

Removing decal residue

I've managed to scrape old decals off an enameled surface, but how does one remove the sticky residue? No solvent I've tried will touch it.—Edward Hosen, Utica, N.Y.

There is a remover specially made for this purpose. If you cannot obtain it locally, try rubber-cement thinner, available at art-supply and stationery stores. This will soften the residue of decal adhesive so that it may be scraped off, or rubbed off with a fingertip.

Painting new plaster

How long a time should elapse before new plaster (not Spackle) is painted?—J. Horner, Knoxville, Tenn.

New plaster contains moisture which should be allowed to dry out before you paint. Offhand, I'd set 90 days' drying time as a minimum unless the room is heated for part of the drying period. In that case, the time could be shortened to two months.

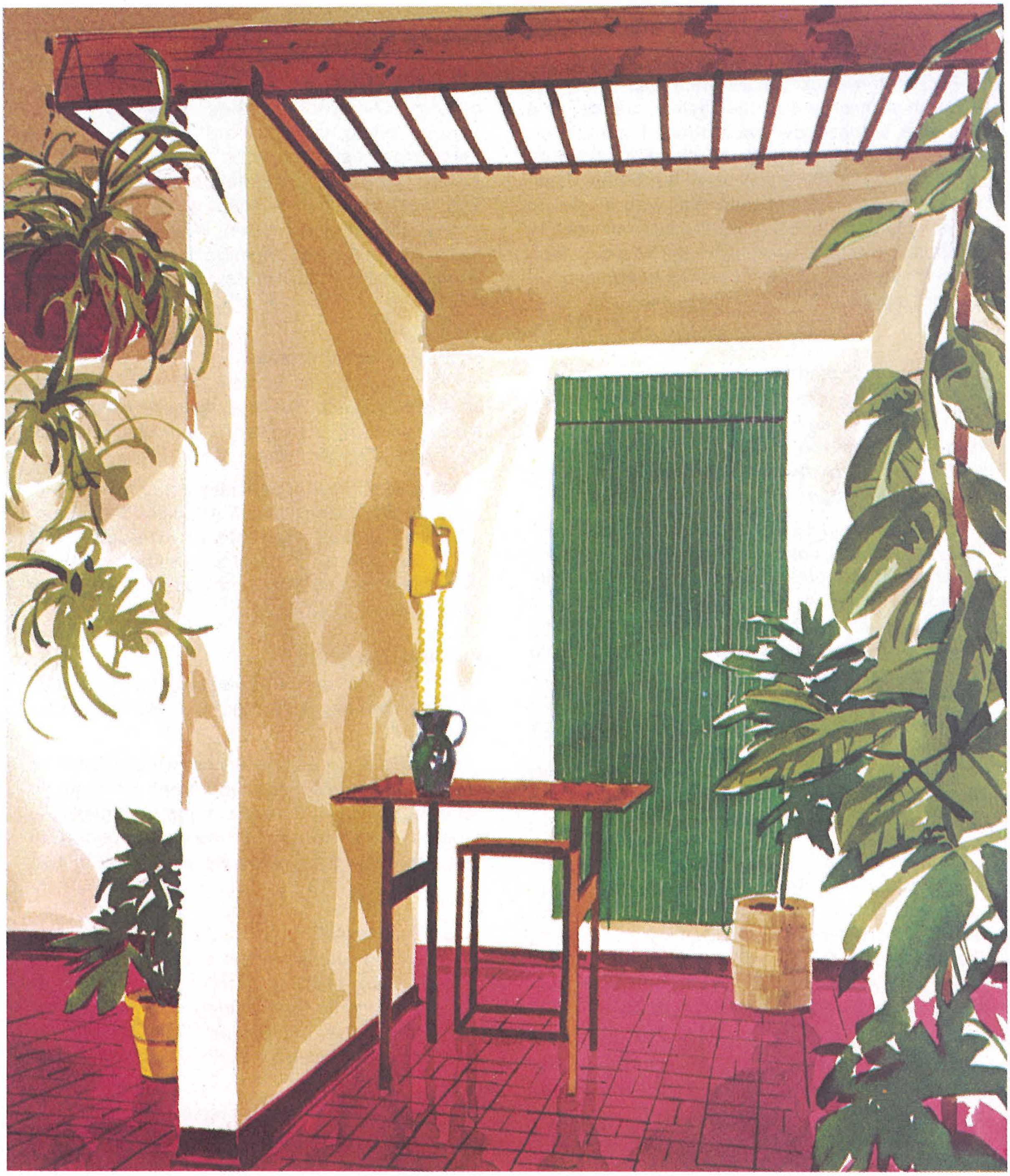
Insulation for A/C

I intend to install central airconditioning this season. There are 3-in. batts in the ceiling, and I'm told by my airconditioning service people I need at least 7 in. of insulation. I've thought this excessive—Are they correct?—J. Heston, Tulsa, Okla.

I would agree with the suggestion, simply on the ground that most older homes tend to be under-insulated. Ceiling insulation should be R-19 to R-22. These R-ratings (thermal resistance) take the insulating value of structural materials into account; an insulation dealer in your area should be able to determine your needs. Check attic ventilation.

by W. Clyde Lammey

How to light a freestanding wall



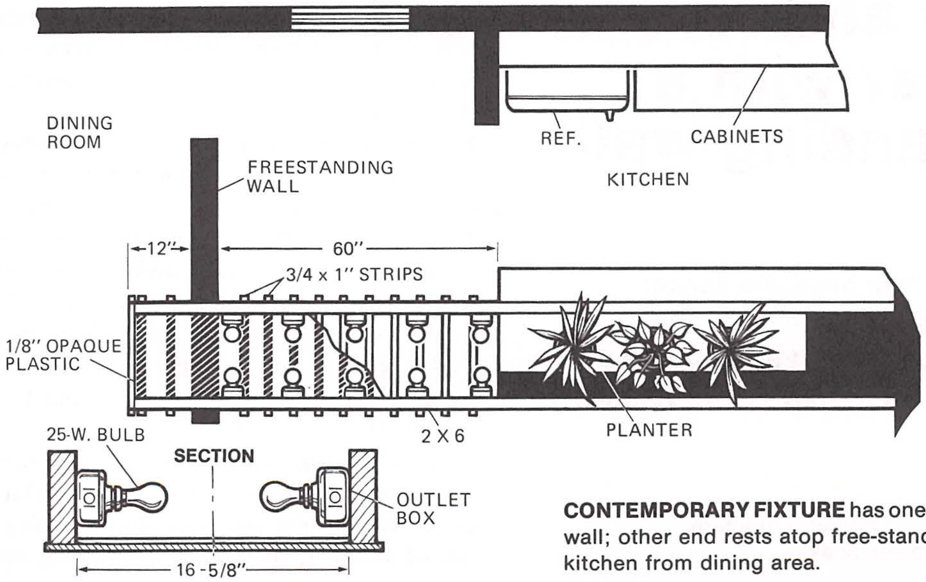
SEE ALSO

Electrical wiring . . . Entryways . . .
Fluorescent lighting . . . Remodeling ideas

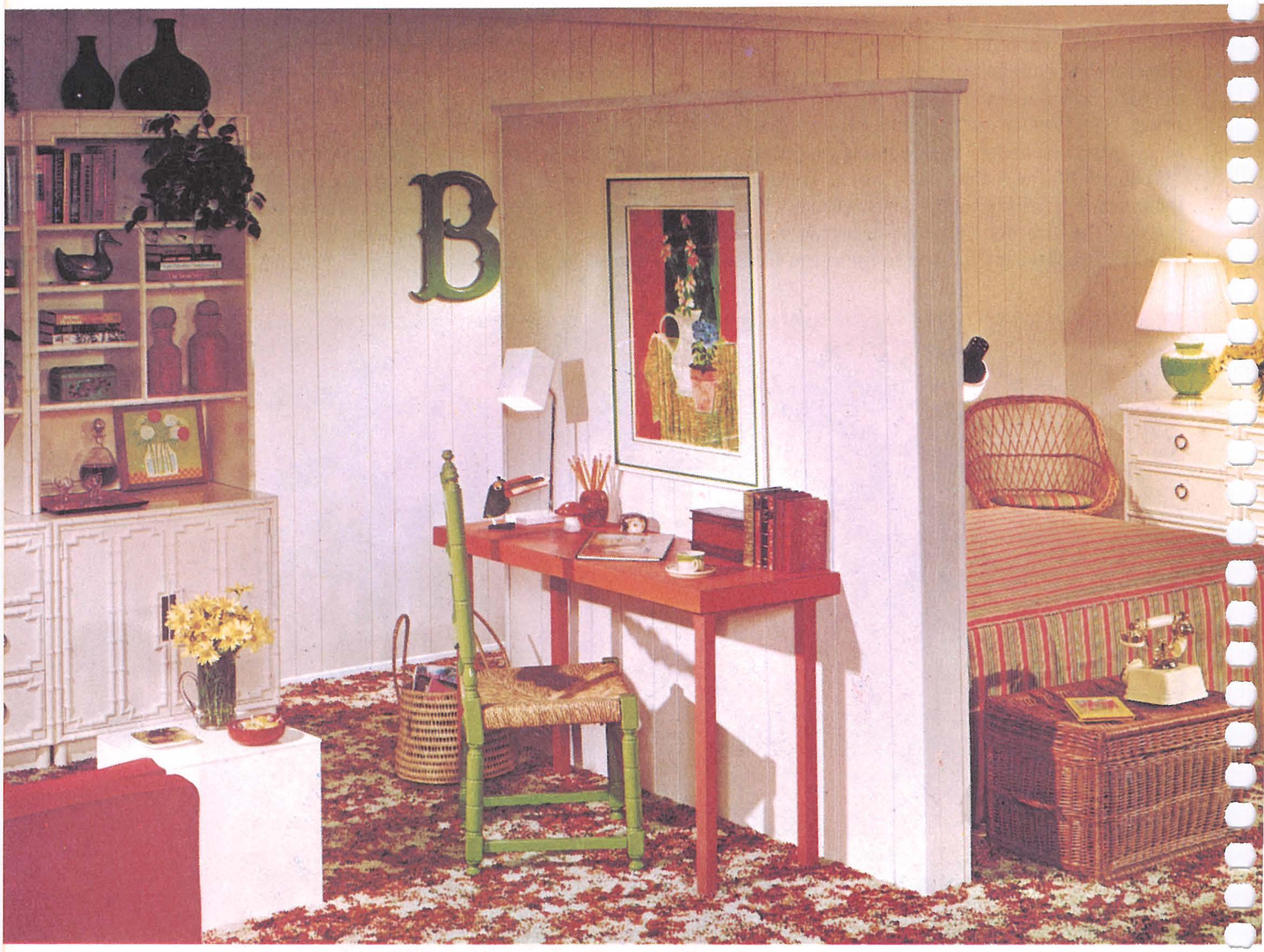
■ WHEN ARCHITECT Juris Curiskis of Edina, MN, wanted to add a light fixture over a freestanding wall he built, he found that what he needed would cost about $200. Even at that price, selection would have been a compromise, so he designed and built this handsome fixture.

Instead of the usual fluorescent fixture, 10 incandescent ceiling receptacles are used. These provide the warmer lighting the owner wanted. Conventional wiring is used to build the fixture. Receptacles are mounted on 4-in. junction boxes and BX cable runs from box to box.

Fixture length is determined by need. In the 7-footer shown, 10 *low-wattage* bulbs were used, spaced equidistant and staggered on opposite sides. The frame consists of two 2x6s held together by ¾x1-in. strips on the bottom and ends. The translucent sheet plastic simply rests on the strips. The end piece, of course, is secured with cleats.



CONTEMPORARY FIXTURE has one end fastened to the wall; other end rests atop free-standing wall shielding kitchen from dining area.



Divide and conquer with a freestanding wall

By HARRY WICKS

Get more from available space: This easy-to-build wall doubles the use of a bedroom and minimizes the disputes when it's shared by two youngsters

SEE ALSO

Bookcase closets . . . Children's furniture . . . Closets . . . Remodeling ideas

A PERFECT "space-doubler" for youngsters sharing the same bedroom, this freestanding wall clearly draws the line between activity and sleeping areas. Gone will be the nightly squabbles over the right time for lights out—and your role as arbiter, happily, will be vastly diminished.

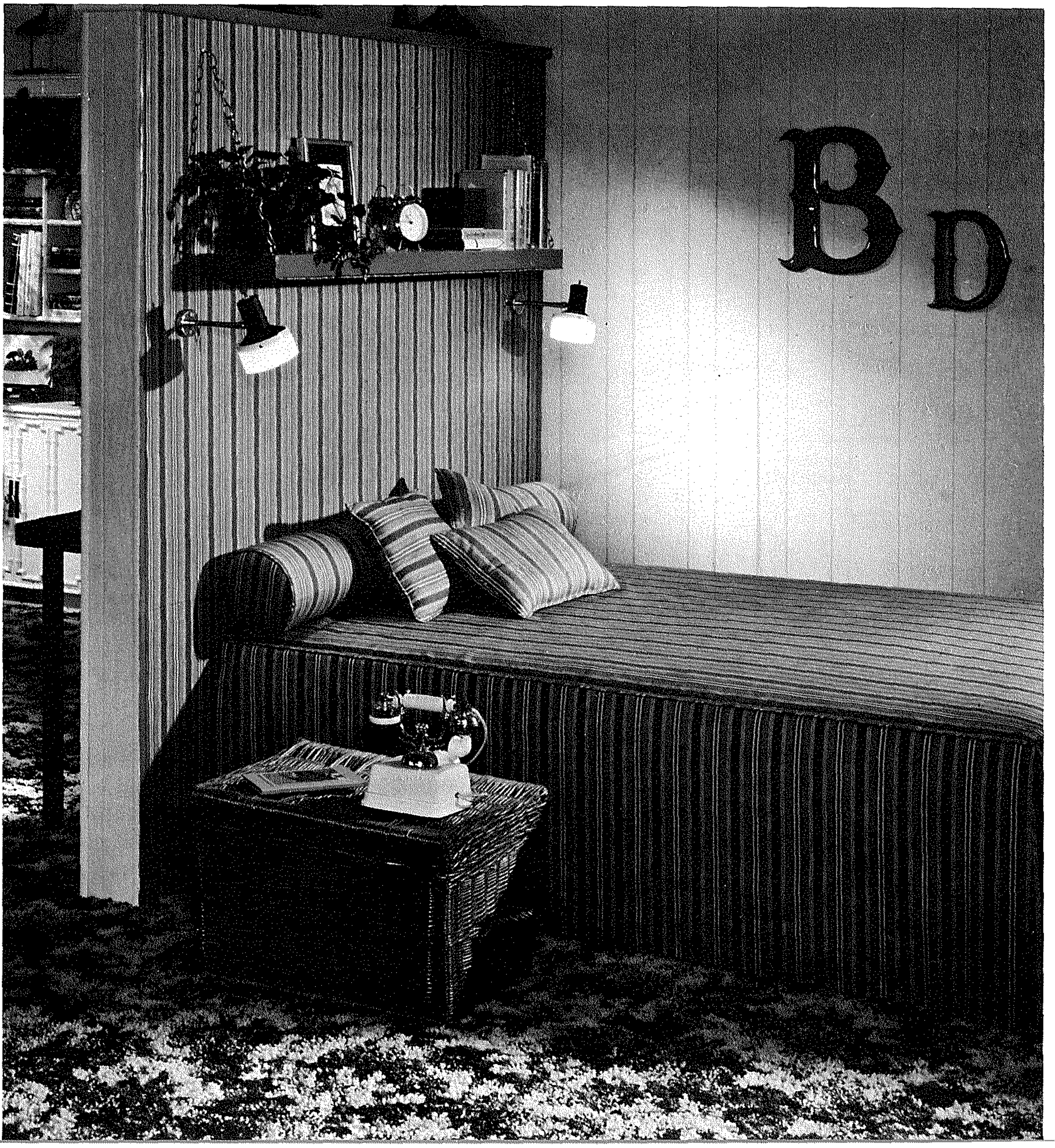
Don't get discouraged about building this project because you have never built a wall before. You needn't be a master carpenter nor own any special tools to test your do-it-yourself skills on this project. The wall consists of a 2x4 framework covered on one side with plasterboard and wallpaper, and on the other side with a durable ¼-in. plywood paneling chosen from U. S. Plywood's Weldwood Prefinished line.

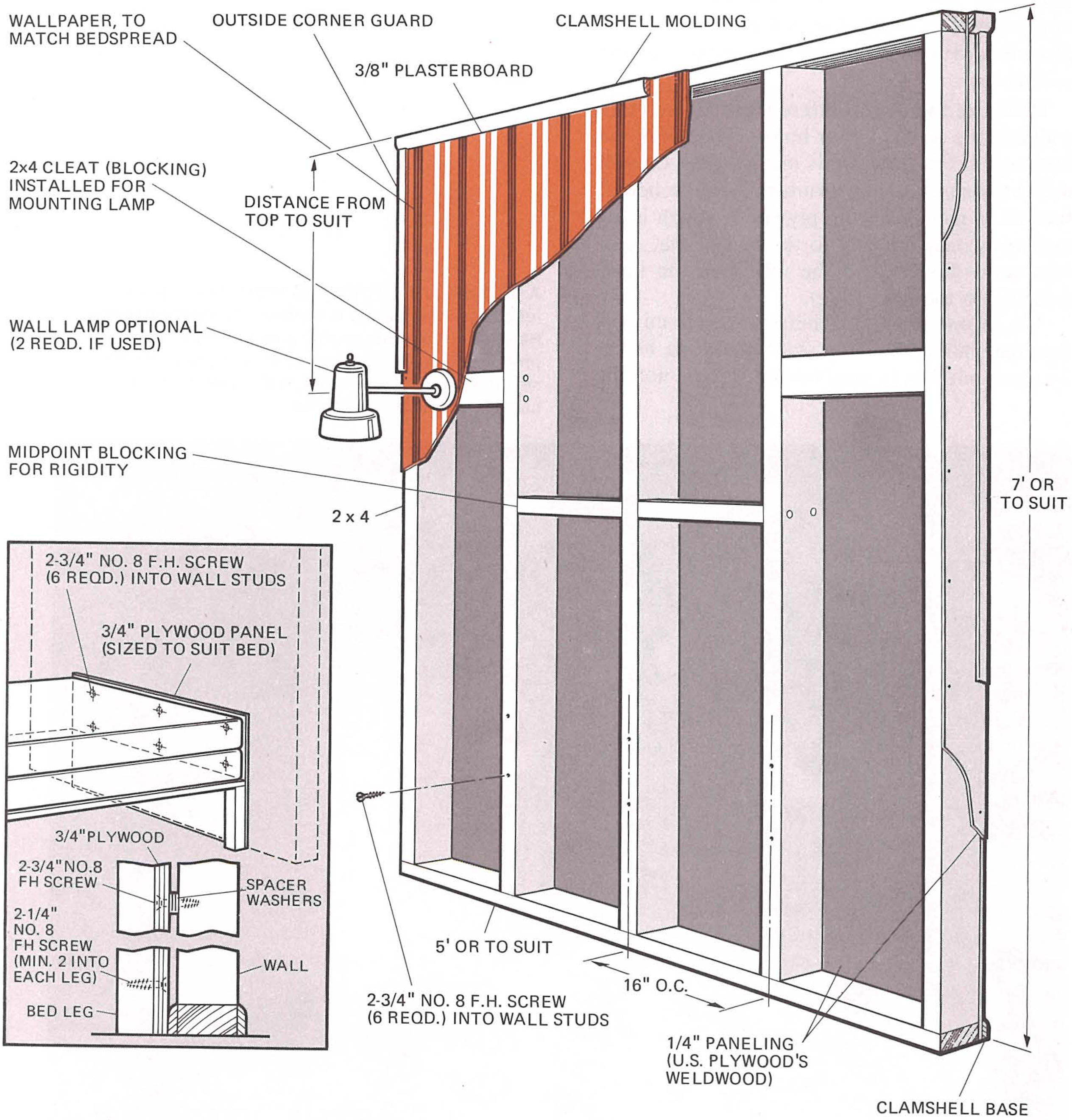
As in conventional house building, the easiest way to build a wall is to assemble it flat on the floor. To prevent the wall from racking (going out of square), the plywood paneling should be applied to one side while the wall is still in the horizontal position. The wall can then be tilted upright and held with diagonal braces while the plasterboard and wallpaper are applied to the second side.

There are two slight differences between this wall and the walls of your house. First, it is *not* fastened to the floor. This means that you will not be tied down to one furniture-layout scheme. Instead, a piece of ¾-in. plywood, which is attached inconspicuously to the bed frame, is in turn screw-fastened to the wall (see the inset drawing on the next page).

The second important thing to keep in mind is that the wall should stop short of ceiling height by about one foot in most homes. If it did not, the

A BRIGHT, SOPHISTICATED bedroom becomes more functional when space is divided into logical-use areas. Here, wall facing study-play area carries a durable, prefinished plywood paneling (facing page); its other side (below) is plasterboard, wallpapered to match the bedspread and the draperies.




WALLPAPER, TO MATCH BEDSPREAD
OUTSIDE CORNER GUARD
CLAMSHELL MOLDING
3/8" PLASTERBOARD
2x4 CLEAT (BLOCKING) INSTALLED FOR MOUNTING LAMP
DISTANCE FROM TOP TO SUIT
WALL LAMP OPTIONAL (2 REQD. IF USED)
MIDPOINT BLOCKING FOR RIGIDITY
2 x 4
7' OR TO SUIT
2-3/4" NO. 8 F.H. SCREW (6 REQD.) INTO WALL STUDS
3/4" PLYWOOD PANEL (SIZED TO SUIT BED)
3/4"PLYWOOD
2-3/4"NO.8 FH SCREW
SPACER WASHERS
2-1/4" NO. 8 FH SCREW (MIN. 2 INTO EACH LEG)
WALL
BED LEG
5' OR TO SUIT
16" O.C.
2-3/4" NO. 8 F.H. SCREW (6 REQD.) INTO WALL STUDS
1/4" PANELING (U.S. PLYWOOD'S WELDWOOD)
CLAMSHELL BASE

resulting look would be wall rather than divider. Before starting construction, make certain you measure bedroom floor-to-ceiling height and scale your divider to it (as well as scaling the divider width to bed width).

The wall facing the active area is most likely to receive some punishment from lively youngsters. Thus, it is clad with the same plywood paneling used on the bedroom walls. Paneling here also gives a feeling of continuity—that the wall is an integral part of the room. Lacking such coordination, it might look like an afterthought.

The second side is covered with ⅜-in. plasterboard. Joints and dimpled nailheads are hidden with two applications of joint compound and the wall is finished with wallpaper to match bedspread and draperies. Conventional molding at top, base and corners supply the finishing touches. If desired, battery-powered pin-up lamps can be installed on the divider over the bed.

The latest slippery synthetics are hard to knot but more than twice as strong. Here are the facts you need to choose a boat rope

By BOB WHITTIER

All about boat ropes

■ GO TO YOUR MARINE DEALER to buy some rope and you are likely to find yourself staring at a bewildering assortment. Today there are so many colors, sizes and types of material that you may be tempted to pick one kind and try to use it for every purpose afloat or, worse still, go back to using an old length of clothesline.

Effective and safe handling of even the smallest boat requires the use of rope, so a working knowledge of modern cordage is indispensable. Some of the new synthetic ropes are so superior that they can save you a lot of money and possibly your boat as well. Often craft that have gone adrift from dock or mooring are seen with broken lines of the wrong type and size.

In ropemakers' language, anything one inch in diameter or less is called "cordage." As the size decreases, the words to use are rope, cordage, twine and string, in that order. For boatmen, the word "rope" refers to the product only while it is still in the store. Once aboard, it becomes "line" such as dock line, anchor line, towline. Light ropes (actually cordage) used to hoist sails and flags are called halyards. The rope used to position the boom of a sailboat is called a sheet.

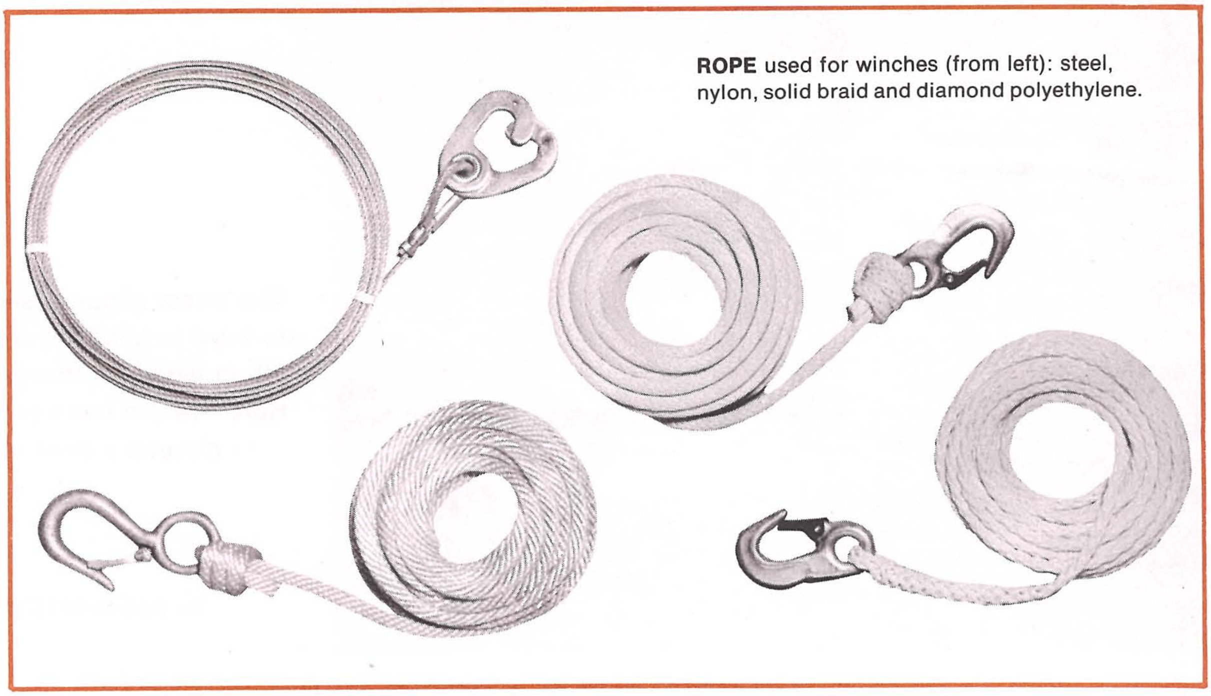
Old boatmen had to be familiar with natural fiber ropes such as manila, hemp, sisal, henequen, coir, linen and cotton. Manila is the only one of these still in much use afloat. Cotton used to be favored for lines aboard sailboats because it had a good "hand," which meant it was comfortable to grasp. Now it is being replaced by more durable synthetics. Never use an old cotton clothesline as a dock or anchor line; it's likely to break and you'll lose your boat.

Sisal rope today is mostly a rough grade offered in 50 and 100-foot lengths in bargain stores. It has about 80 percent of the strength of manila and suffers from rotting. Though cheap and useful for binding bundles ashore, it should not be confused with stronger manila.

Manila rope is still universally available and is often the only kind at hardware stores far from yachting centers. It appears low in price, diameter for diameter, when compared with synthetics, but the latter are usually 150 to 290 percent stronger. A thinner synthetic can be selected to do a given job safely, and the first cost then is not so much greater. It lasts so much longer than manila that the final cost is even lower.

Manila has its good and bad points. It will take any common knot or splice easily and dependably. It is easily grasped and held, and is still popular for anchor lines on small boats where

SEE ALSO
**Boat accessories . . . Boating . . . Knots . . .
Sailboats . . . Water skiing**



ROPE used for winches (from left): steel, nylon, solid braid and diamond polyethylene.

sunlight soon dries it out. But if stowed while wet in a rope locker, it will quickly lose its strength from rot. It is also hurt by acids, oils and other chemicals.

Used as a mooring line in the water, it can be attacked by pollutants, slime and marine borers. Constant immersion accelerates deterioration of its vegetable fibers and it can lose 50 percent of its strength in one summer. It can, however, be bought treated to resist rot and marine growths, and a boatman can treat his own manila with rope preservative.

Popular synthetic ropes include nylon, polyester (sold under trade names like DuPont's "Dacron"), polypropylene and polyethylene. There are others, and some special-purpose synthetic ropes made of blends. A boatman may encounter many trade names; study manufacturers' literature to sort these out. Most pleasure boatmen can get along with the four basics mentioned above.

Nylon rope is up to 290 percent stronger than manila and considerably more durable. It does not rot and is not attacked by marine borers. It can last five times longer than manila, but can suffer from prolonged exposure to sunlight and sometimes stiffens after long immersion in colder water. It is slightly heavier than water and sinks. Nylon's outstanding characteristic is its elasticity. It stretches under load and has excellent shock resistance. It makes a good anchor, mooring or towline but is poor for lines used to adjust the set of sails and is sometimes tricky when used on a winch. Because it stretches under load, some knots tend to jam tighter in it.

Dacron rope is called both Dacron and polyester, depending on the maker. It has slightly less sheen than nylon, and is about 220 percent stronger than manila. Like nylon, it is resistant to water and chemicals, will not rot, can safely be stowed while wet, and will sink. Its outstanding characteristic is that it stretches very little. This makes it favored for lines on sailboats that are used to hold sails in place in the proper shape. Dacron makes a poor anchor or mooring line because it does not stretch to absorb jerks.

Polyethylene and polypropylene rope are much alike. Polyethylene has about 160 percent more strength than manila and polypropylene about 175. Both gain about five percent strength when soaked in water, where nylon tends to lose five to 10 percent. Both are rot and mildewproof and are highly resistant to common chemicals. They are less elastic than nylon, more so than manila, and make good general-purpose towlines. A water-ski line, for example, should not be too rubbery. The outstanding feature of polyethylene and polypropylene ropes is that they float on water indefinitely. As towlines they will not sink and foul the towboat's propeller. In some forms, they tend to be stiff and hard and often do not hold knots very well. Clips and splicing are used to make secure connections. The use of these ropes is growing rapidly.

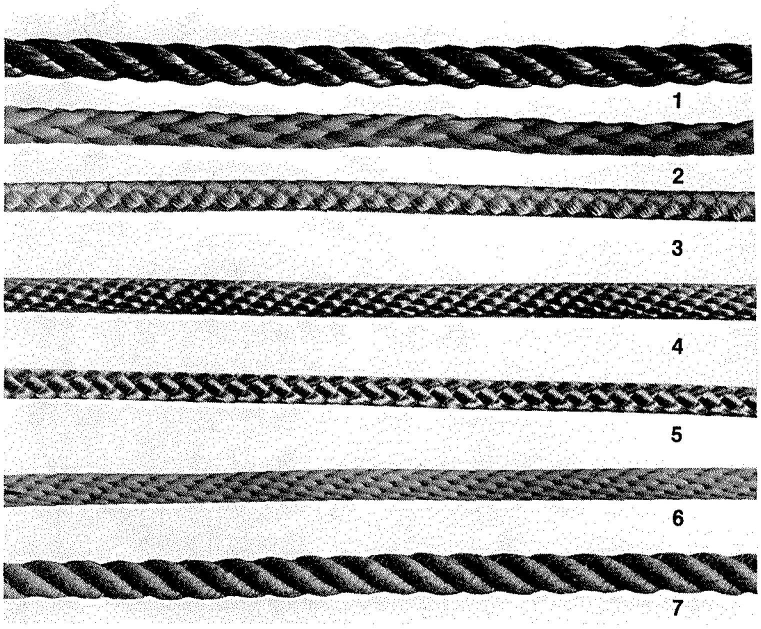
Any suitable material can be made into rope, either by twisting or by braiding. Common manila is an example of twisted construction, common sash cord of braided. The machinery used makes twisting faster and usually a cheaper method—a useful point to know when comparing ropes.

synthetic fiber ropes

Modern synthetic fibers are made by extrusion. The material in liquid state is squeezed out of a tiny nozzle like toothpaste from a tube, after which it hardens into long filaments that are wound on spools or bobbins. Rope made from continuous strands like this is called monofilament rope in contrast to spun rope made from short strands. Some synthetic ropes can be slippery, so for certain uses where a good hand grip is necessary, such as in commercial fishing lines, sailboat sheets, and industrial uses, the monofilament can be chopped, spun into yarn and made into spun synthetic rope. Since the strength of any spun rope depends on the friction between the many filaments for resistance to slippage between the strands, spun synthetic ropes tend to be less strong than monofilament ones of identical synthetic material, although generally above the strength of manila.

When a twisted rope is bent sharply, strands on the outside of the bend are stretched and may break. Strands in braided rope lie more diagonally to the rope's length and are strained less in a bend. Braided rope is favored for sailboat lines for this reason when it must go through pulleys. Often sailboat lines pass through jam cleats and deck winches and need uniform diameter and compression to work well. Solid or "double braided" rope, rather than "hollow," is best for this. Hollow braided ropes are used for ski tow lines, small anchor lines and jobs having few or no pulleys.

While synthetics will usually accept and hold knots, there are pointers to know. Knots that depend on friction can be less reliable when used in a slippery rope. Nylon can slip excessively when used to make a common cleat hitch or square knot. A stiff braided rope can tend to "back off" some knots and hitches. Rope makers publish pamphlets with good advice on selecting knots to match your rope; your marine dealer may have some. The average boat owner is safe with the general rule that a rope's working strength should be only about one-fifth its rated breaking strength. For a small boat, a thin synthetic may be strong enough but hard to handle so it is worthwhile to buy a larger diameter that is easier to use.



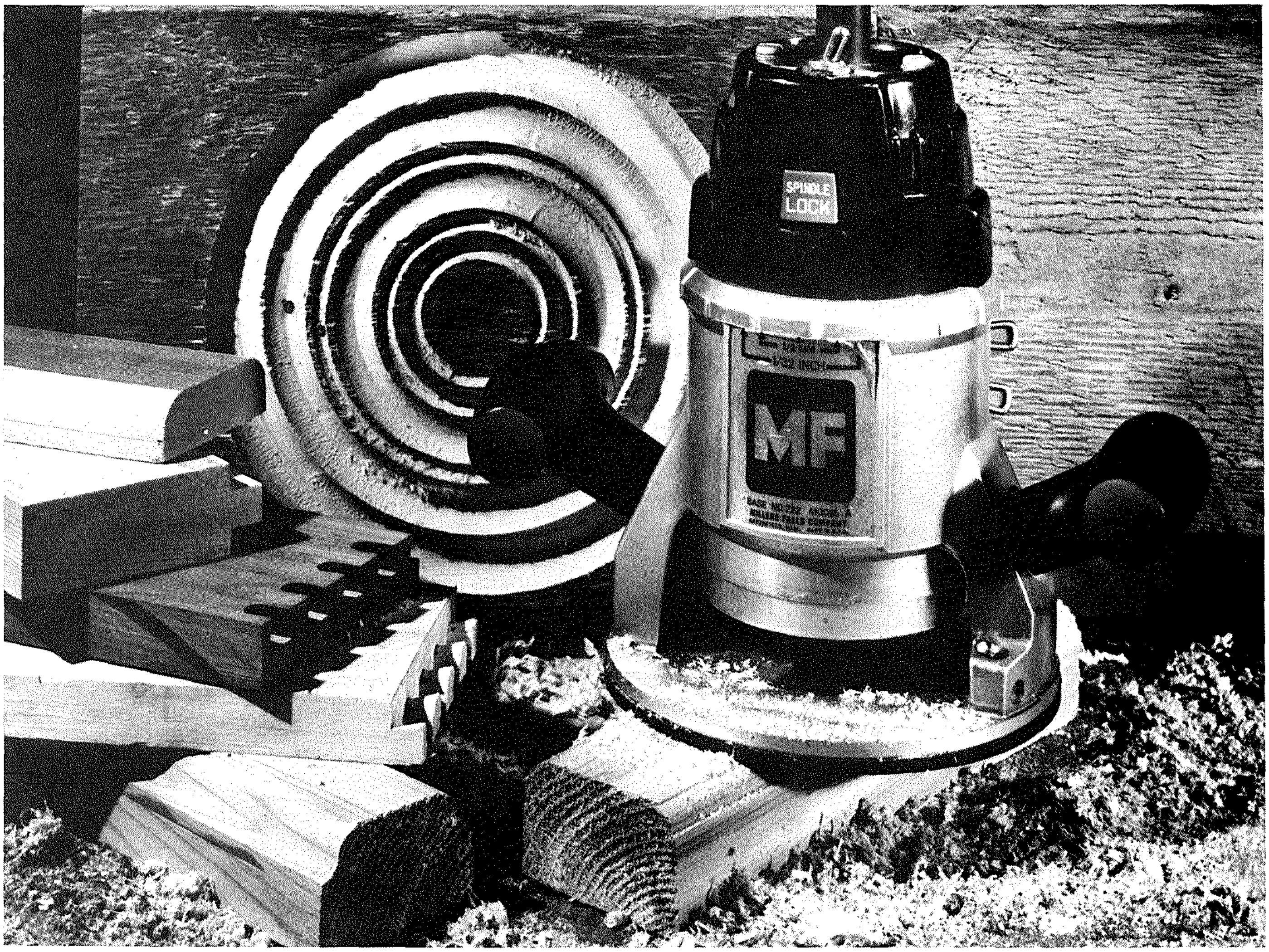
OLD AND NEW ROPES include twisted manila (1), diamond braid polyethylene (2), pimm sheet for comfortable handling (3), solid braid nylon (4), V-braid nylon (5), solid braid polypropylene (6) and twisted cotton (7). Choice depends on strength, price, "hand," and long life.

Synthetic ropes are now available in a variety of colors, with a light coffee color recently popular for yachting use. Olive drab synthetic is frequently military surplus that may be overaged. Colored strands woven into a rope may be a maker's trademark or indicate special-purpose rope. Check the maker's literature. Polypropylene and polyethylene use colors to make them more visible while floating on the water.

While water and rot are the enemies of natural fibers, sunlight tends to damage synthetics. Store them in a cool shady place if possible to take full advantage of their long and useful life.

WHICH ROPE TO CHOOSE— WHERE TO USE IT

Sisal: For economical bagging, wrapping ashore.
Manila: General-purpose economy use. Don't store damp. Treat with preservative for underwater use.
Dacron: Use as sailboat lines for high strength and low stretch.
Nylon: Dock, anchor, mooring lines where stretch acts as shock absorber. More expensive, stronger, longer life. Won't rot, but hardens in sun.
Polyethylene and polypropylene: Use for floating line for ski towing. Slippery, holds knots poorly.
Strength ratings: Manila, 100 percent; polyethylene and polypropylene, 160 to 175 percent stronger than manila; nylon and Dacron, 220 to 290 percent stronger than manila. For boat use, choose diameters that are easy to handle.



How to use a router

Many home craftsmen mistakenly consider a router to be a difficult tool to work with. Though it gives sophisticated results, it is actually easier to master than you would guess

By HARRY WICKS

SEE ALSO

Discs, wood . . . Drawers . . . Joinery . . . Laminates, plastic . . . Moldings . . . Routers, accessories

■ I'D BE WILLING to lay odds that the screeching and whining of a router will be music to your ears (if not your wife's) after you have had your first crack at pushing the tool through a piece of stock. If you haven't already tried one because you felt—as many workshoppers do—that a router is beyond your skills, be advised it's one of the greatest power tools you can get your hands on.

Undeservedly, the router has the reputation of being difficult to handle. The plain fact is that it's one of the easiest-to-use and most satisfying power tools you will ever handle.

Mechanically, the router is simple; it consists of two pieces, a motor with a chuck mounted on one end and a base that holds the tool in a vertical position for routing. A bit or cutter is mounted in the chuck and protrudes down to do the cutting. The maximum depth of cut is determined by length of the cutter being used. The high speed of the router—anywhere from 20,000 to 28,000 rpm—teamed with a clean, sharp cutter will generally produce a cut so smooth that further sanding is unnecessary.

In essence, a router does much the same work as a stationary shaper *with two differences;* the tool is carried to the job, instead of the other way around, and a router can be used for on-the-job tasks such as hinge-mortising and trimming plastic laminates. (In my opinion, the router is the only way to go if you do a lot of plastic laminating.) If equipped with the proper bit(s), a router can be used on nonferrous metals.

router safety

General power-tool safety rules apply to the router. For example, make certain that the tool is properly grounded if it's not of the double-insulated variety; keep the tool, motor and cutters clean (always being sure that the motor's air vents are not clogged by sawdust), and, because of the flying chips that the tool creates, always wear safety goggles.

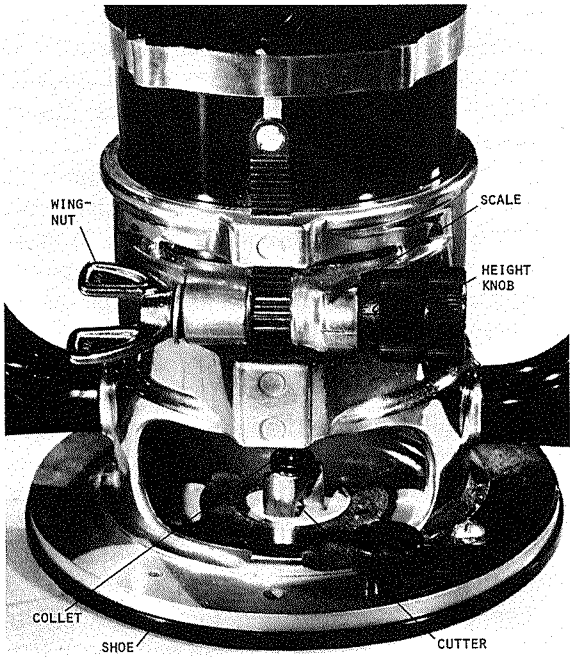
Good safety habits you should acquire include: 1) always disconnect the electric cord when installing or removing a cutter; 2) make certain that the piece to be worked is securely clamped; 3) double check to assure that *all* adjustments are tightened before turning on the motor—you should *never make any adjustments while the router is running;* 4) hold the router firmly at all times; 5) though it may seem obvious, as you finish a job and turn off power, place the router on its side on your workbench and hold it until the cutter stops spinning.

router bits and accessories

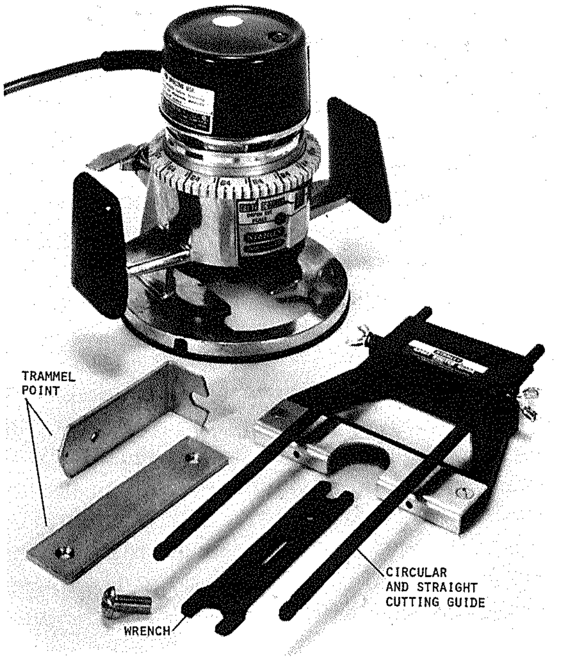
The first rule regarding bits and accessories—and it's a must—is to use only those cutters and accessories specifically designed for use in high-speed routers. Much of the router's versatility comes from the variety of bits and cutters now available. (One major manufacturer claims there are more than 170 cutters on the

Typical routers and accessories

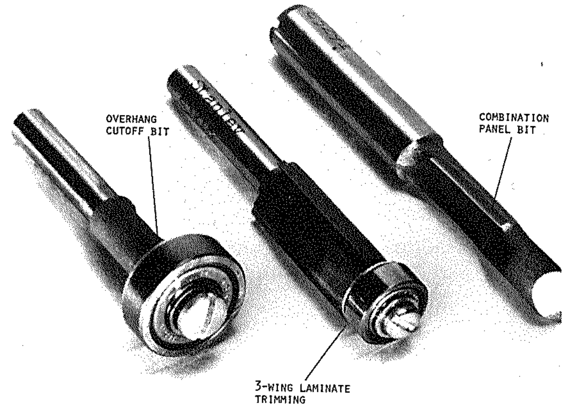
SIMPLEST OF ALL power tools, the router consists of two basic pieces—the motor with a chuck on one end of its shaft and a base to hold it. These are from Stanley Tools (left), Rockwell (center) and Black & Decker (right).



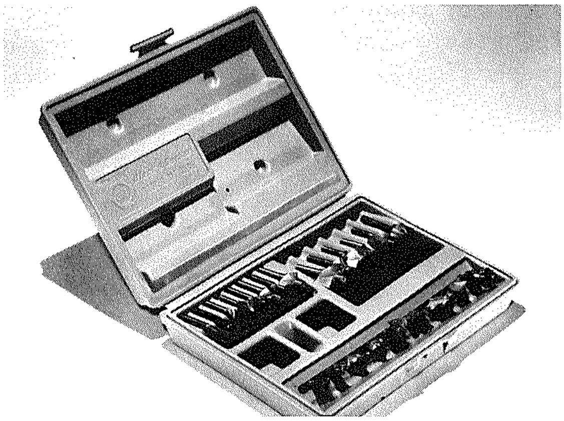
MOST ROUTERS have a quick-read depth indicator plus a method of adjustment for precision settings.



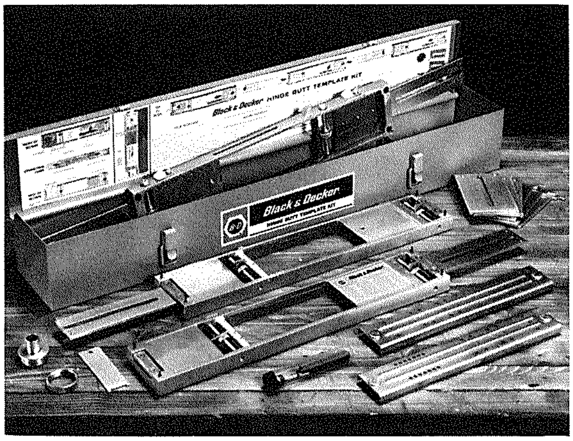
TWO NECESSARY accessories are a trammel point (left) for circle cutting and a straight cutting guide.



THREE BITS from Stanley Tools aren't cheap but well worth the investment for a steady router user.



ROUTER-BIT case from Black & Decker keeps bits where you can find them and protects the cutting edges.



DOOR-AND-JAMB butt template is a timesaver for a professional who wants to hang many doors in a hurry.

market.) Many bits sold today are originally designed to suit specific commercial needs. Ultimately, these special-purpose bits found their way into home workshops.

In simplest terms, there are three types of bits:

- *Pilot type* (such as the edge-rabbet cutter shown on page 2602) is a one-piece bit that has a cutter portion and a pilot at bottom which rides against the work edge while the cutter does its chore. Bits for decorative edge-trimming are of this design.
- *Cutters used for grooving* (mortise-type). These do not have a pilot, and the cutting edge(s) extends full length of the cutter. To use

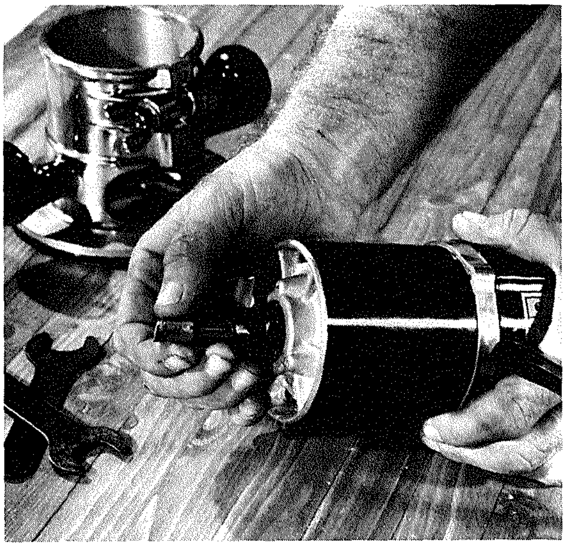
these bits (except when freehand cutting), it is necessary to use a guide: either an improvised clamped-on piece of wood or the factory-made version which is attached to the router.

- *Panel bits,* which have a drill-type tip. These are used when it is desirable to plunge through the workpiece and then commence routing the design.

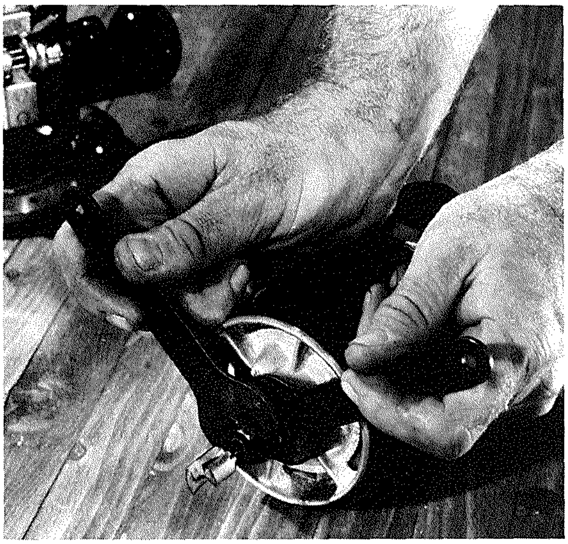
As mentioned above, variations on the basic cutters are almost endless. And now most makers are offering almost all types in a carbide version. Like saw blades, these cost more initially, but for the frequent user, they are worth extra cash outlay. If your shop production is limited however, you are probably better off buying noncarbide bits and having them sharpened occasionally.

A router without accessories could be compared to a bench saw equipped with a combination blade only. For example, you need attachments to guide the machine for straight and circular work (when using nonpilot-type bits). The straight guide is invaluable when making grooves and dadoes. And using a trammel point,

Installing the cutter

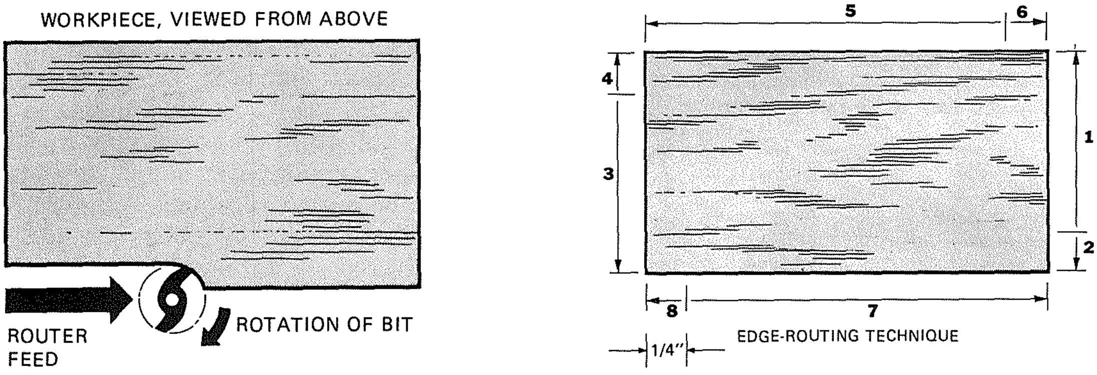


AFTER DISCONNECTING the power, insert the bit fully into the router chuck and then back it out ⅛ in.



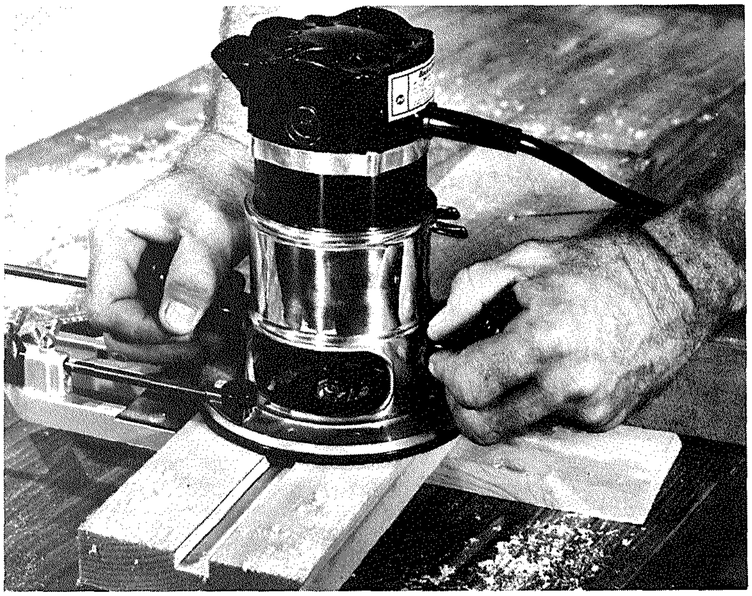
TOOL is placed on bench and one wrench is slipped onto the chuck while second wrench tightens the locknut.

Correct way to feed a router into workpiece

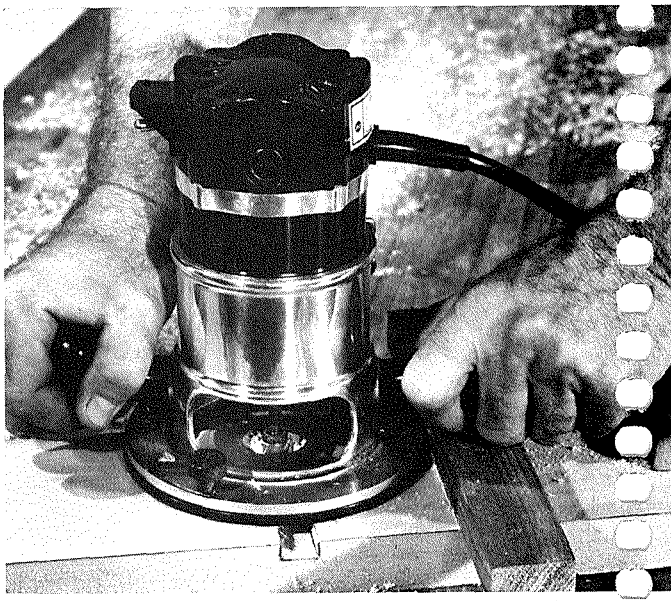


SINCE MOTOR rotates clockwise, move the router from left to right. The sequence at right saves splintered corners.

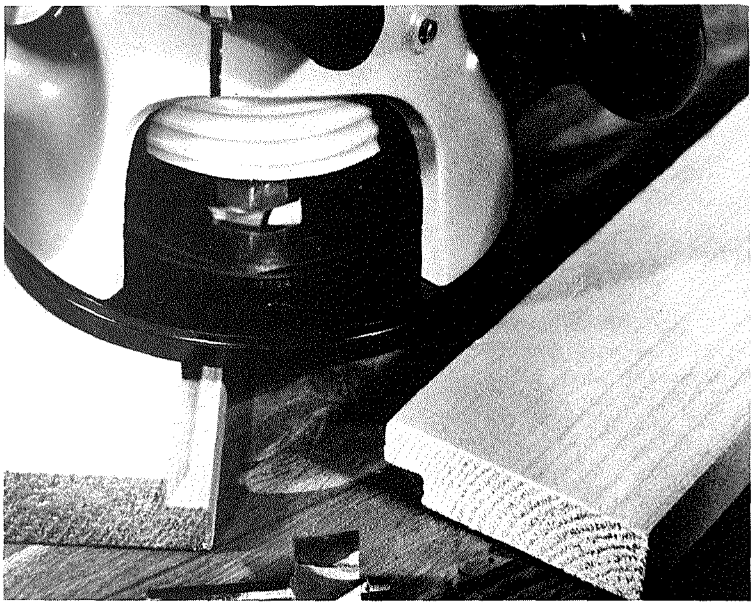
Cutting grooves and dadoes



TO CUT groove, it is necessary to guide the router. Here, a commercially made guide is being used.



IF CUT must be farther away from the guide, a clamped wood strip—which handles clear—works well.



EDGE-RABBET cutter (foreground) has a pilot that rides against workpiece edge while rabbet is formed.

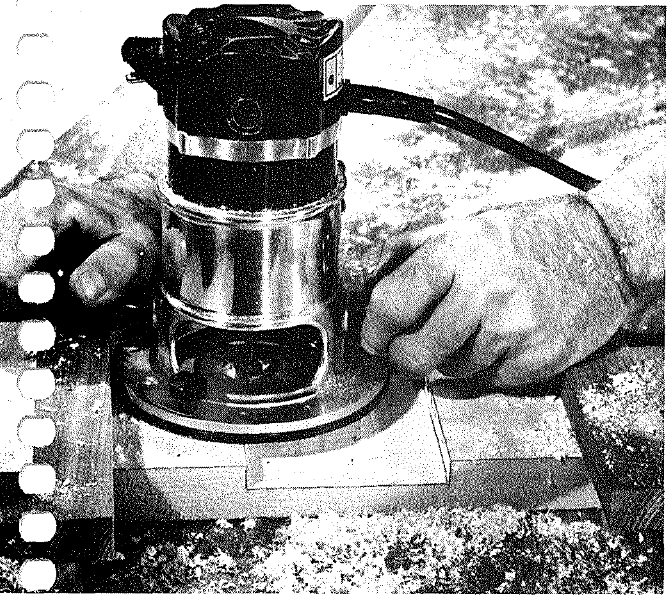
you'll find you can quickly cut the neatest, most accurate circles in the least time.

You can—and in many cases you must—make your own accessories. For example, a long board fitted to the router shoe will let you safely straddle the cut portion when you are cutting an extra-wide groove. But, generally, the manufactured accessories are in such an economical price range that it makes good sense to buy them.

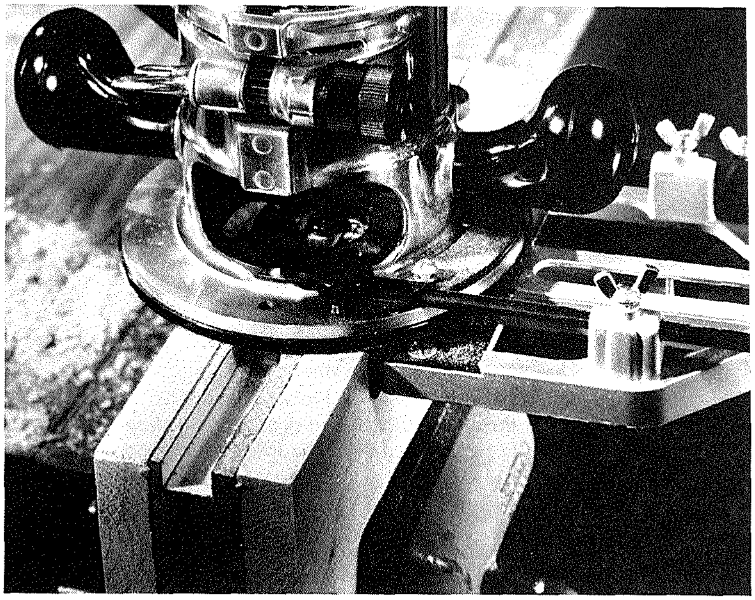
installing the cutters

After selecting the bit you are going to use, loosen the collet locknut. Insert the bit all the way into the collet, finger-tighten the locknut, then back out the bit about ⅛ in. (This procedure is to prevent the collet from shattering.) Place the motor on the workbench and slip one wrench over the chuck and hold its end against the benchtop. Holding the chuck with this wrench, tighten collet with the second wrench. (Note: Some routers are designed so the collet can be tightened with one wrench. On these, the arbor is locked by means provided on the router motor.) To remove a router bit, simply reverse the procedure.

Loosen the locking nut on the base and install the motor. Adjust the motor so the cutter is at desired depth and tighten the base locking nut. All quality routers have a ring or other means for making fine, precise depth adjustments. Consult



FOR WIDE grooves, tack two boards to limit the router's travel and clamp work to bench for safety.



TO CUT groove in narrow piece, clamp work between two scrap pieces of wood that provide shoe support.

the maker's manual to determine how to make fine adjustments on your router.

direction of feed and thrust

Viewed from above, the router cutter spins in a clockwise direction. Thus, the router should be moved from left to right; this allows you to cut against bit rotation. Feed rate and depth of cut to use will depend a great deal on the material being worked. If possible, make test passes on scraps of the same stock. Keep feed pressure constant, and do not force the router because you will slow down the motor excessively. This will give a poor cut—rough and, in all likelihood, cutter-burn spots. More important, it's unfair to the tool and will shorten its life.

On particularly hard woods or problem materials, your best bet is to make the cut (or cuts) in several passes, lowering the cutter for each successive pass.

When edge-routing with a pilot bit, follow the sequence as shown in the drawing. That is, start the first side ¼ in. in from the corner and feed through to the right-hand corner. Then return to the starting point and plough off the ¼ in. at the left-hand corner. Repeat these steps around sides two, three and four. The first four passes are across the end grain and the next four with the grain. By using this sequence and feeding the router slowly when going left, you'll have splinterfree corners.

grooves and dadoes

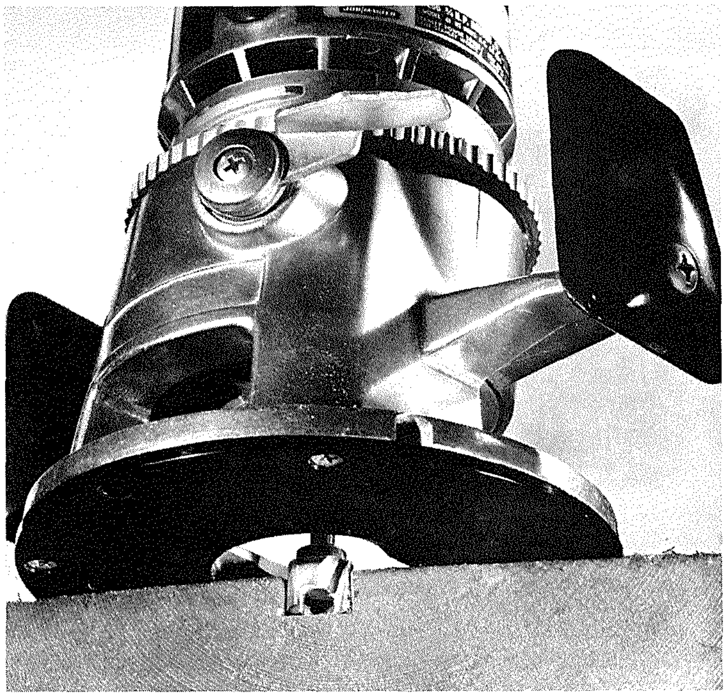
Two of the most basic cuts in woodworking can be easily, quickly and neatly made with a properly handled router and accessories. The important points to remember are that the router cannot be allowed to drift or walk away from the guide. And the shoe must always have ample, solid surface to ride on (so it won't rock on the workpiece). As can be seen in the photos, these are easy-to-make cuts. In all probability, these will be the first that you will attempt with your new router.

After you have familiarized yourself with your router by making some test grooves and dadoes, you will probably want to try some different cuts.

The simplest and most common cutting done with a router (right behind the two cuts mentioned above) is decorative edging. It's about the quickest, surest way to add a professional touch to any project.

decorative edging

A shaped edge, whether Roman ogee, beaded or simply rounded-over (quarter round), improves the looks of just about any cabinet door, tabletop or drawer front. Actually, doing these edges goes so effortlessly that it is easy to give in



VIEWED FROM the bottom the shoe of the router sits squarely on the wood surface with the bit cutting out a groove. The shoe should have enough solid surface to ride on so that it won't rock. Cutting grooves and dadoes such as this is the most common and simplest use for a router.

to the temptation to put an edge on just about everything in sight. To avoid the mistake of *over-routing,* decide *which* edges will receive *what* treatment—and stick to the plan.

Bit versatility can be increased by simply raising or lowering the cutter. You can put decorative edges on circular workpieces, too. To do it, use the circle-cutting guide and counterclockwise feed.

When in doubt, feed the router extra slowly. As you gain experience, you'll find that many woods have a tendency to splinter off large pieces ahead of the cutter. A slow feed rate and sharp cutter usually prevent this happening, but if it still happens, you should make the decorative edge with several passes. Lower the bit for each succeeding pass until the desired shape (depth) is achieved.

A lipped door is easily made using the ding-over and rabbet-cutter bits. But sequence is important: Make the rounded edge first, then the rabbet. Since the rabbet cutter's pilot will not have a surface to bear against, affix a guide for the router sub-base (shoe) when cutting the rabbets.

circular work

Circles cut with a router will be absolutely accurate, as can be seen in the pair of photos at top of page 2606. The first is a perfect circle being cut from plywood using a trammel point and panel-type bit; the other is a decorative plaque created by routing concentric circles with trammel point and core-box bits of various radii set at a different depth for each circle. Variations on this type of design are almost unlimited; each bit at a different cutting depth will provide a visual difference.

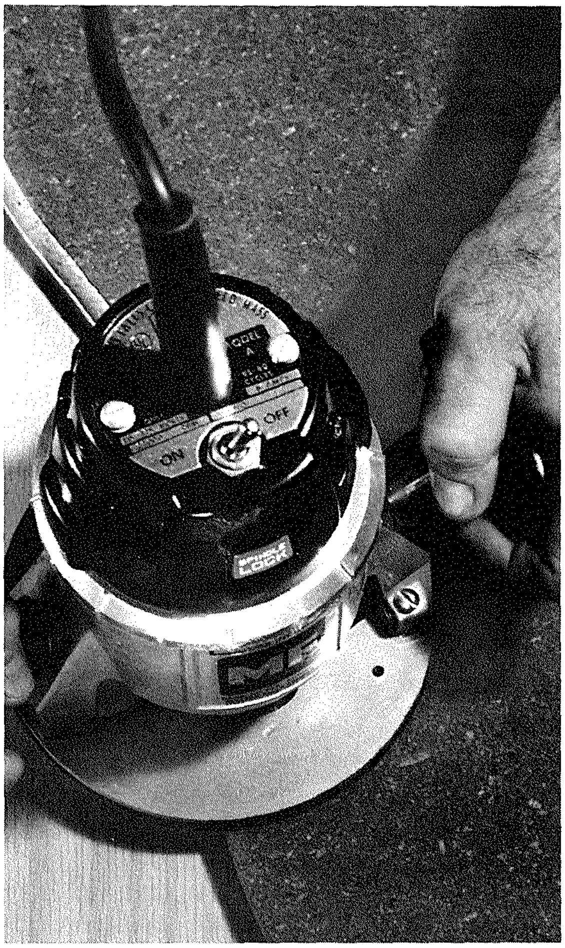
plastic laminates

Because of looks and durability, plastic laminates are now commonly used by do-it-yourselfers. But plastic-laminate fabrication requires precise workmanship. Since plastic laminates are not cheap, it makes good sense to practice on scrap before you put your router to an actual project.

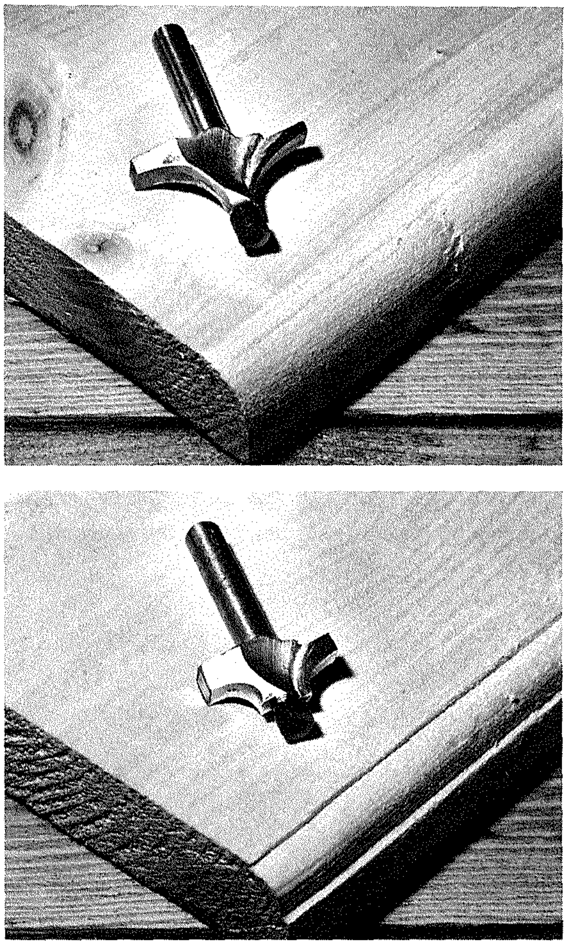
Since conventional steel bits won't hold cutting edges if used on plastics, *always* use a carbide bit. Cutting edges on carbide-tipped bits hold up indefinitely and, more important, give neat, chipfree cuts. Of two types—one-piece solid and self-contained ball-bearing—you'll need two (of either design): a straight cutter for overhang trimming and a bevel bit (varying from 15° to 22°) to finish-dress the joint.

If you prefer the one-piece solid (as I do), smear petroleum jelly on the laminated self-edge to avoid any chance of the cutter creating a scorch mark. But if you have the ball-bearing type, acquire the habit of frequently disassembling parts and cleaning them with lacquer thinner. Then oil and reassemble. If you don't, the bearing eventually clogs with contact cement

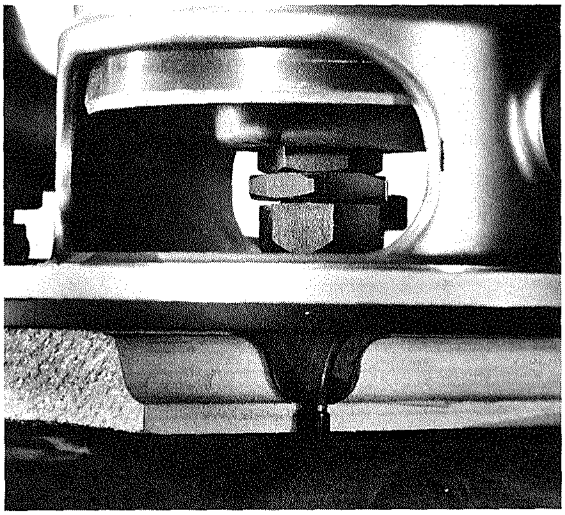
How to cut decorative edges that improve your projects



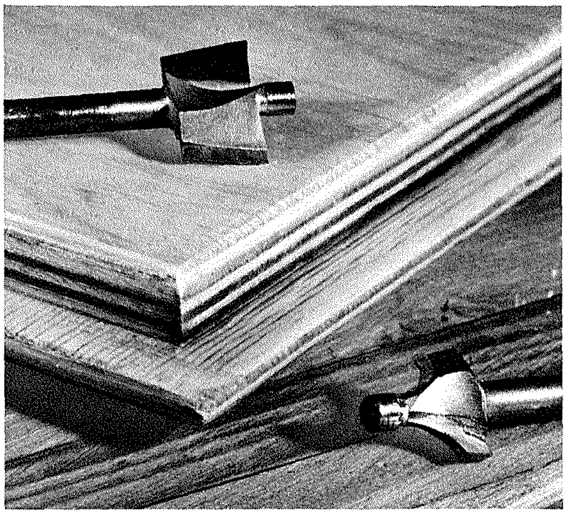
PILOT BIT (here, a beading cutter) can be used around the edge of either a square or free-form workpiece.



TYPICAL EDGES shaped using a pilot-type bit: rounded-over (quarter round) at top and beading.

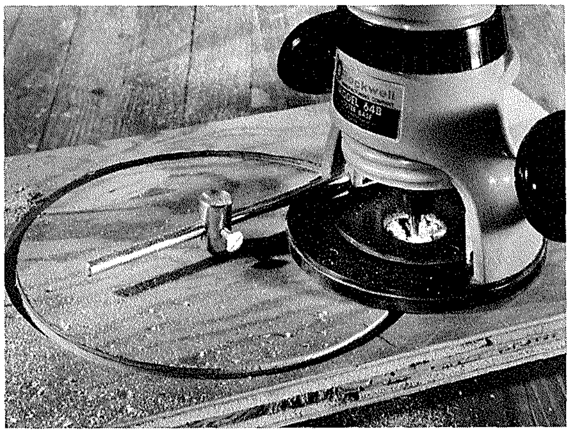


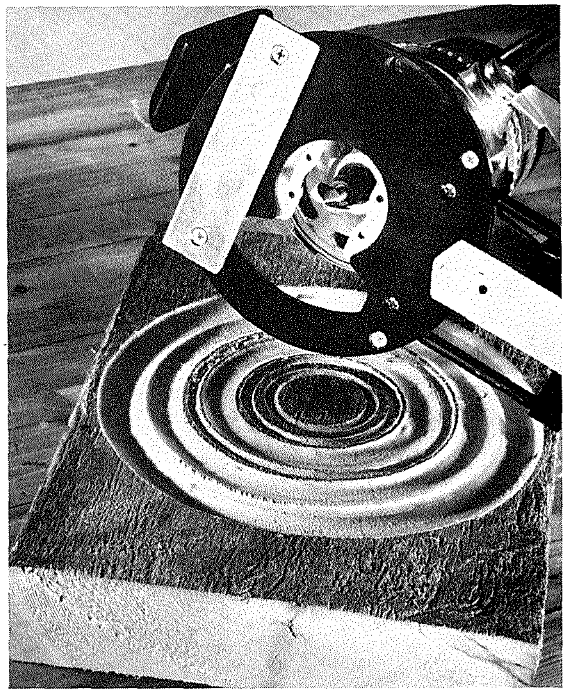
ROMAN OGEE illustrates how flutes do the cutting as the pilot at bottom rides against the work edge.



LIPPED DOOR is formed using rounding-over bit on the outside edges and ⅜-in. rabbet cutter on inside.

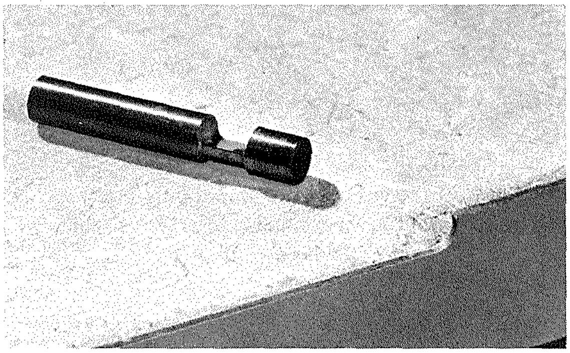
How to handle circular work with no chance of error



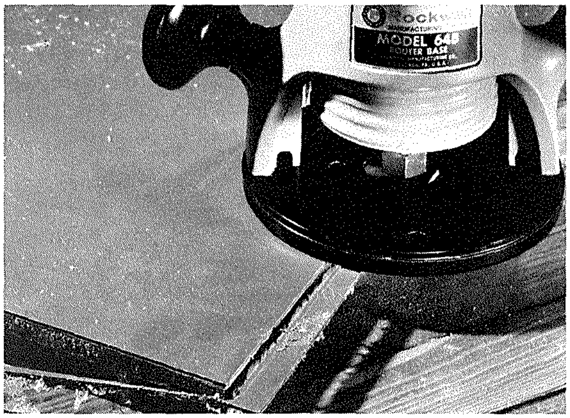


TRAMMEL POINT is affixed at the desired radius on guide bar secured in router shoe; straight bit does the cutting. The decorative plaque (right) was created with a core-box bit set at various depths for the concentric circles.

Working with plastic laminates



1. **SELF-EDGE** is applied to the top and trimmed with a straight carbide bit. Type shown is solid, one-piece.



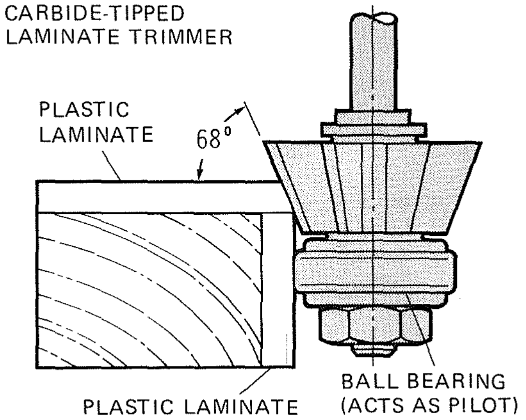
2. **LAMINATE TOP** is placed and trimmed, using the same cutter. See text for ways to prevent burns.

and spins at the same speed as the cutter—and then it will leave a burned line along the self-edge. The bearing *must* be free-spinning so it will rotate at the speed of router movement—*not the cutting flutes.*

Make sure that edges of the material to which the laminate will be cemented are square and true.

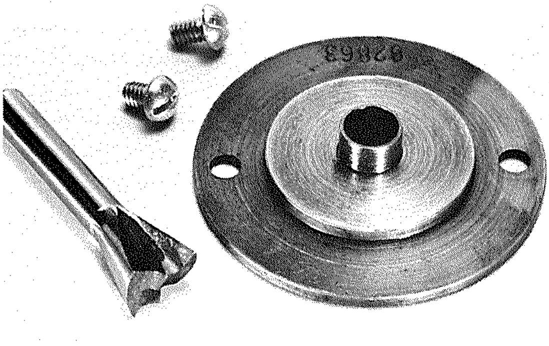
The self-edge is cut slightly larger than the surface to which it will be adhered; then affixed to the wood with contact cement. With the workpiece clamped to the workbench, the excess laminate is trimmed off with the straight bit.

Next, the top is bonded (again with slight

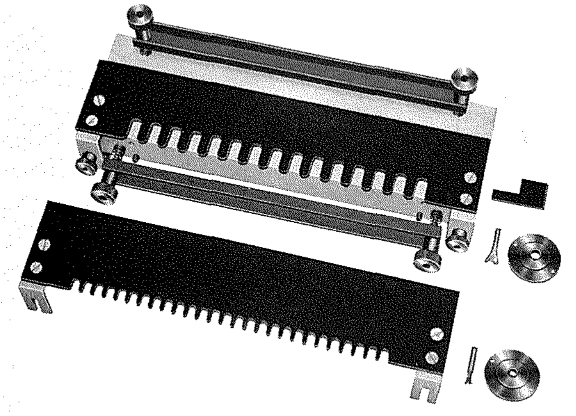


3. **EDGE** is finish-dressed with bevel. Ball-bearing type bit is also fitted with a carbide tip.

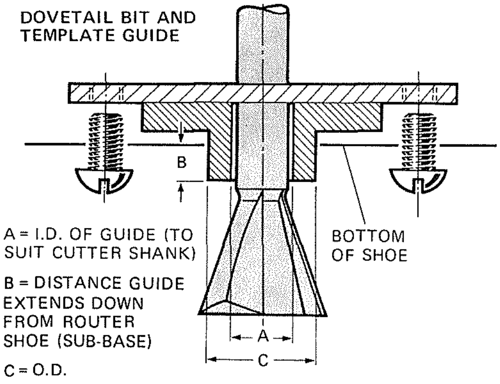
Dovetailing the easy way—with power



TO CUT DOVETAILS, you need a dovetail bit and template guide in router shoe and the dovetail template (below).



DOVETAIL TEMPLATE component parts: Notice that the main base is fastened to wood to provide clamping area.

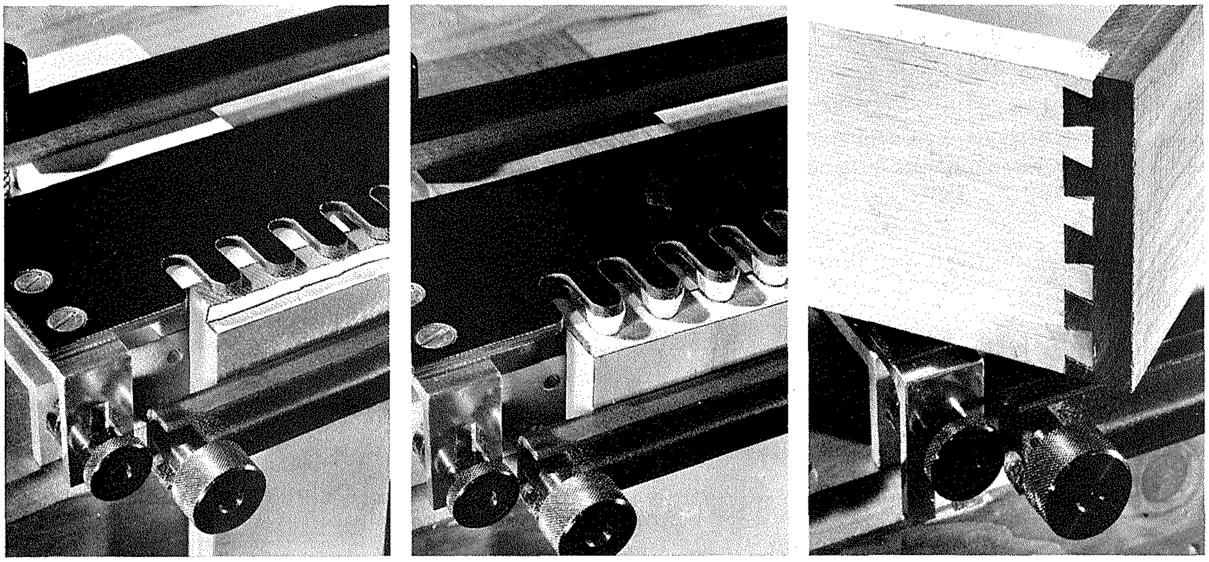

DOVETAIL BIT AND TEMPLATE GUIDE
B
A = I.D. OF GUIDE (TO SUIT CUTTER SHANK)
B = DISTANCE GUIDE EXTENDS DOWN FROM ROUTER SHOE (SUB-BASE)
C = O.D.
BOTTOM OF SHOE
A
C

TEMPLATE GUIDE must be securely fastened to the router shoe and the bit set at the precise cutting depth.

overhang all around) and trimmed with the straight cutter. Finally, all edges are dressed with the bevel cutter. Beveling requires only a slight pass since very little stock is removed.

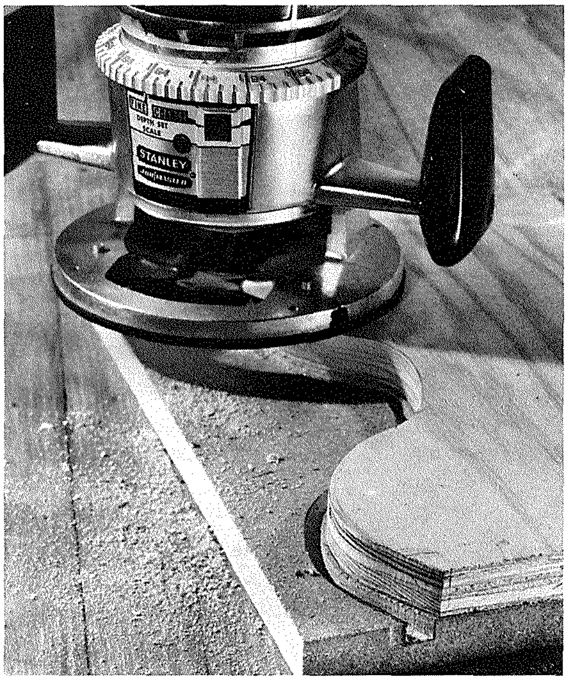
dovetail joints

One of the strongest joints in woodworking, the dovetail is widely used in commercial furniture-making. With the help of a dovetail template and a suitable template guide, your dovetail joints will soon rank with the best. No matter which brand of template and guide you buy, make certain you read and understand the manufacturer's instructions.



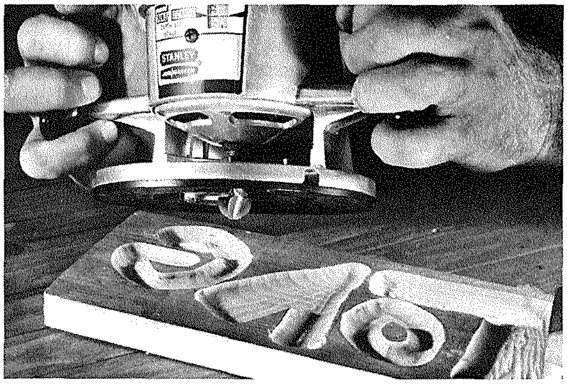
WITH BOTH PIECES clamped in the template, router is moved left to right along complete edge (to prevent splintering). Second pass is also left to right, following fingers. The work is then test-fitted (right).

Template routing



TEMPLATE CUTTING is done using a template guide and pattern cut slightly under the finish-work size.

Freehand routing



A REAL CHALLENGE for a creative craftsman, freehand routing is done without guides or templates.

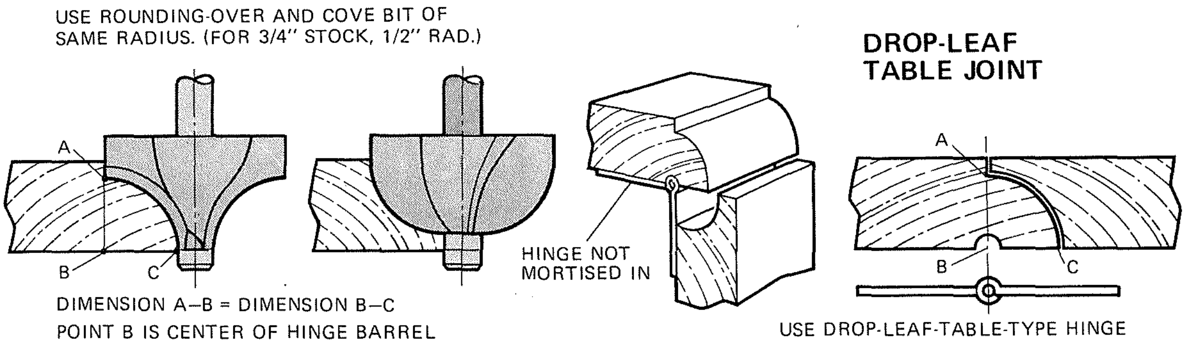
To make dovetail joints, first install the template guide in the router sub-base. (Note: Since the method of affixing guides varies from maker to maker, buy guides of the same make as your router.) Next, with the router installed in the sub-base (shoe), insert the dovetail bit so it extends exactly $^{19}/_{32}$ in. below the router base.

The base of the dovetail template is always affixed to a piece of wood (or the workbench). Use fh screws in screwholes provided in the base. When clamped in position, the front (overhanging) apron of the base should butt against the front edge of the workbench or board (see photo, page 2607) fastened to the base.

With the template set up as instructed by the maker, always make a test dovetail joint first on scrap of the same material with which you will work. Make no mistake, dovetailing is precise work, so solve all problems—settings, cutter depth and the like—before pushing the router through your work. After obtaining a perfect cut on scrap, you can proceed on the work.

Since the boards are reversed after you make the cut, both boards are placed in the template with inside edges facing out and up. The top (horizontal) piece is first placed temporarily against the left-hand stop with its end extending about ½ in. beyond the main template base. Then, the second piece is placed underneath the finger template and against the other left-hand stop. At the same time, move the first piece until it is flush with the second (see photo, page 2607). When both pieces are perfectly lined up, tighten all template thumbscrews.

When making the dovetail cut, never move the router on or off the template with motor running; there's too high a risk of damaging the template with the cutter. And always make your first cut along the entire edge of the workpiece—without sliding in and out of the fingers—to prevent chipping the edge.


USE ROUNDING-OVER AND COVE BIT OF SAME RADIUS. (FOR 3/4" STOCK, 1/2" RAD.)
A
B
C
HINGE NOT MORTISED IN
DROP-LEAF TABLE JOINT
A
B
C
DIMENSION A–B = DIMENSION B–C
POINT B IS CENTER OF HINGE BARREL
USE DROP-LEAF-TABLE-TYPE HINGE

After moving the router from left to right for this first cut, shape the dovetails carefully, moving in and out of the fingers. Again, the router should be walked from left to right. After the cut is completed, turn off the router. When the cutter stops spinning, remove router from the work.

Remove the boards from the template and test the joint. If your test work on scrap was accurate, you should have a perfect joint. But if fit is loose, lower the bit slightly (perhaps $^{1}/_{64}$ in.), replace boards in template and re-rout. (If tight, raise the bit by that distance.) Once the template and router are set to produce a perfect dovetail joint, any number of dovetails can be cut accurately. Rabbeted drawer fronts, as well as the joint shown in the photos on page 2607, can be dovetailed, too; it is necessary to reset the template stops, and you should refer to the manual packed with your template.

template routing

Template guides are available in various sizes. A typical one is shown at the top of page 2607. The B dimension of the guide must be less than the thickness of the template you are using or the router will not sit flat on the template. The i.d. of the guide (A) should be slightly larger than the diameter of the router bit to assure clearance. Work being cut will vary in size, by the distance between the cutting edge of the bit and the o.d. of the guide (C). Be sure to allow for this offset when cutting your template (master pattern).

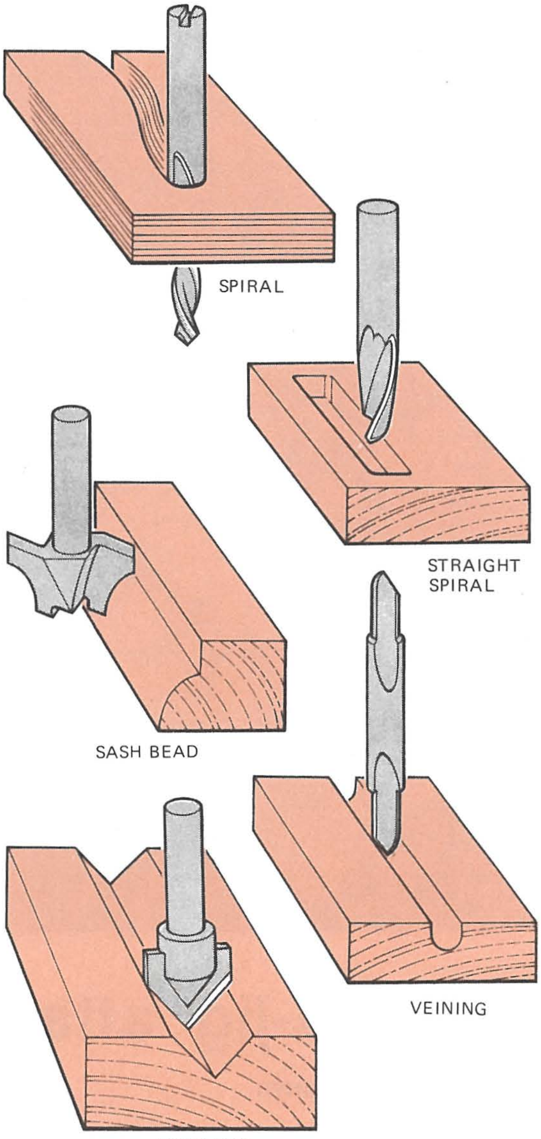
To make the cut, clamp the template to the piece to be routed. With a straight bit in the router, plunge the spinning cutter into the work until the router base is flat on the template. Then, follow the pattern, making certain that the template guide is *always in contact with the pattern.* Since there is no wear and tear, the template can be saved for future use.

freehand routing

Once you've gained experience and confidence, you'll find the router an extremely efficient shaping and carving tool when used freehand. It can be used to turn out decorative items, lettered signs and the like in minimum time. Remember that the deeper the depth cut, the slower the rate of feed (there's more resistance to your movements).

You can rout out the design proper as illustrated in the photo on page 2608 or raise the design by routing out the backround. Frequently, in freehand routing it is a must to affix a long board to the router base so that the router will straddle the routed-out sections in the work. Simply cut the board to desired length, drill two holes to suit the router shoe and countersink them for screws.

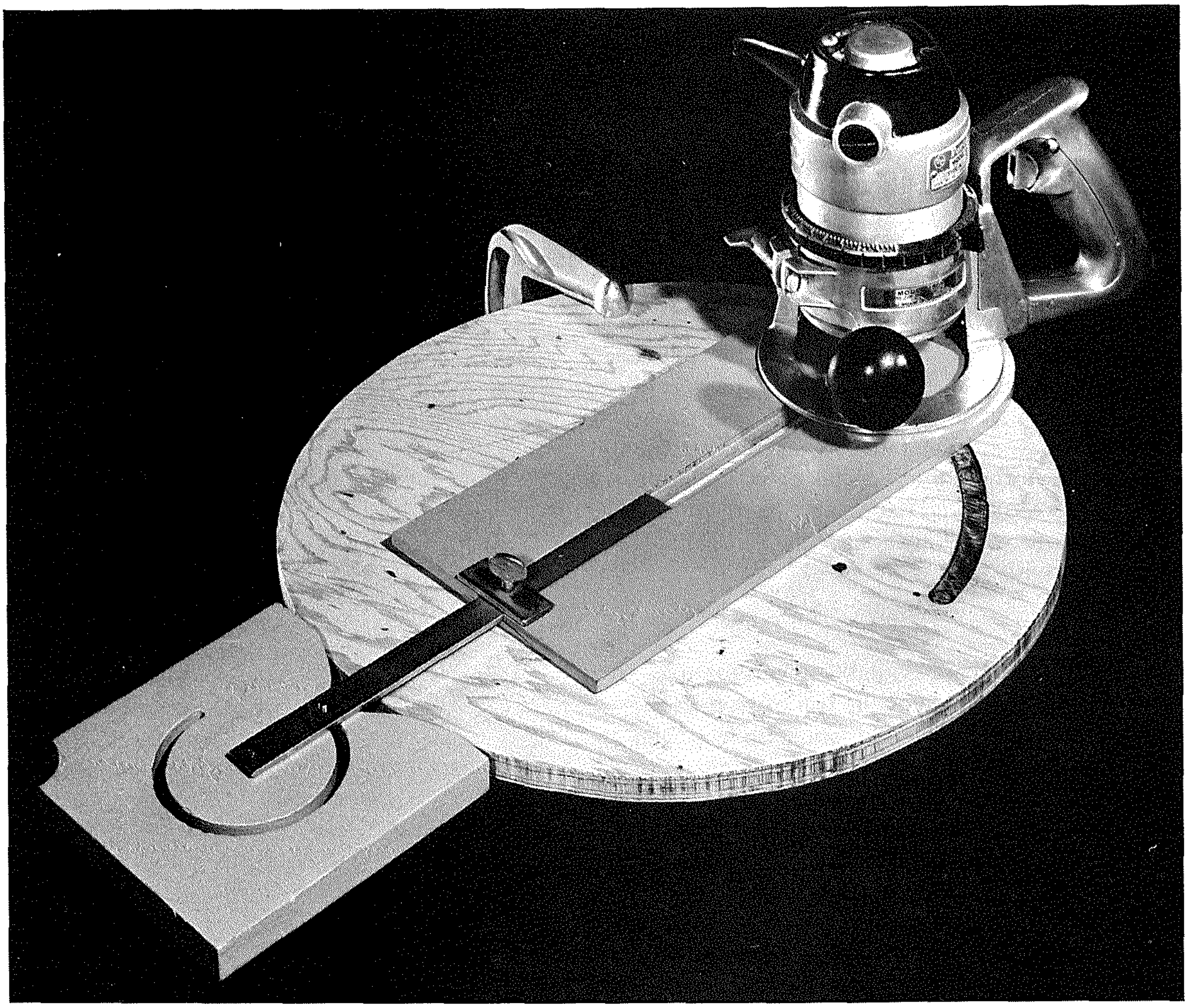
Special-purpose bits for experts



Technical Art by Peter Trojan

drop-leaf table joint

A cove bit is used to make the concave cut on the table leaf; a rounding-over bit—of the same radius properly extended—makes the cut in the tabletop. Use a core-box bit for the barrel hinge mortise; its location must be precise. This is a tricky joint, so first test on scrap before routing the work.



A ‘dial-a-jig’ attachment for your router

By WILLIAM G. WAGGONER

■ TAILORED TO SUIT the router you own, this attachment is smooth operating, easy to adjust and does the chores that normally require two separate attachments. Besides serving as a guide for curved and angular work, it can also be used for slot and circle cutting. The big plus is that the circle-cutting attachment is adjustable from 1 to 21 in. simply by reversing the tongue in its slot.

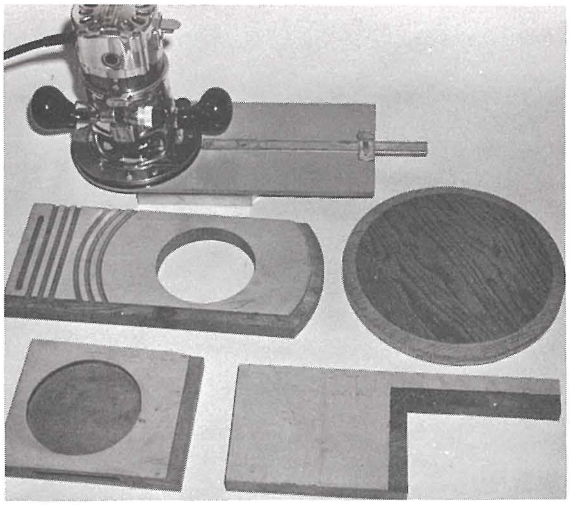
After cutting the ¼-in. hardboard to the proper rectangular dimensions for your particular router, mount the router on one end and scribe about the router base for the half-circle shape. (Most router bases have holes provided by the manufacturer for attachments.) While the router is in place insert a small bit and drill a pilot hole. Remove the router and enlarge this pilot hole to 1 in.

Rout the ¾-in. slot to within about a ¼ in. of the circumference of the 1-in. hole, then rout the ¼-in. slot all the way through. It is easy to do this by clamping the material on a table against a fence and using the fence as a guide for your router base. After routing, trim the scribed circular section.

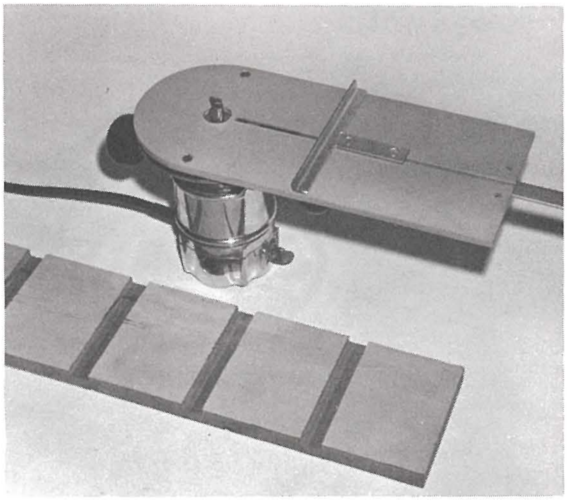
Next, cut two pieces of bar stock 2¼ in. long (of the same material as the adjustable tongue).

SEE ALSO

Discs, wood . . . Power-tool stands . . . Routers



SEVERAL OF THE cuts that are made possible by using the attachment are shown above. With a little ingenuity, you can get even greater versatility.

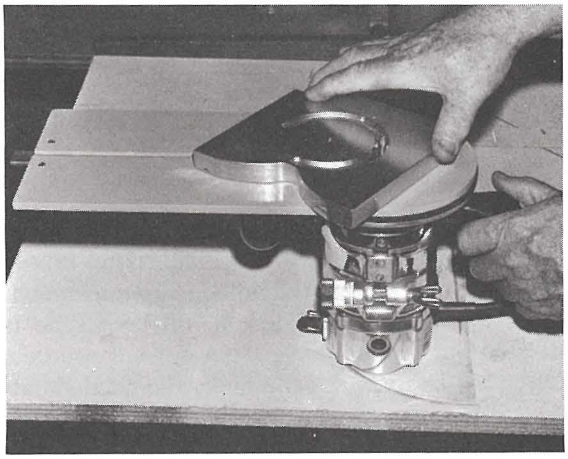


SLOT AND GROOVE-CUTTING attachment is made by butt-welding one of the ¾-in. flats to a piece of ½-in. angle iron. Matching pieces are then perfect.

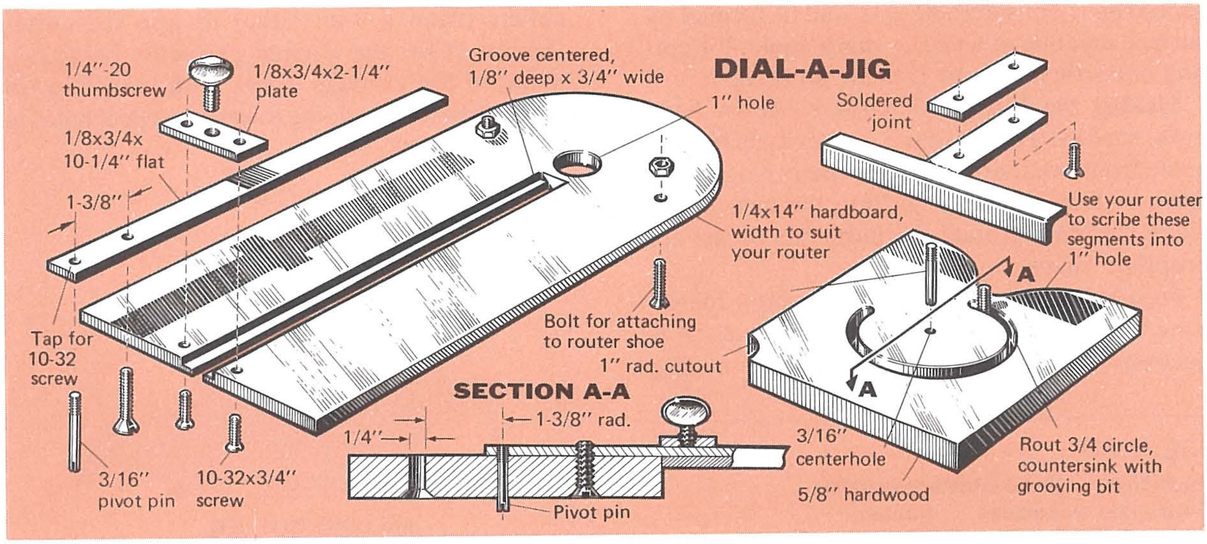
The flat metal is available at hardware stores in 3-ft. lengths. Make certain that the length you select is straight.

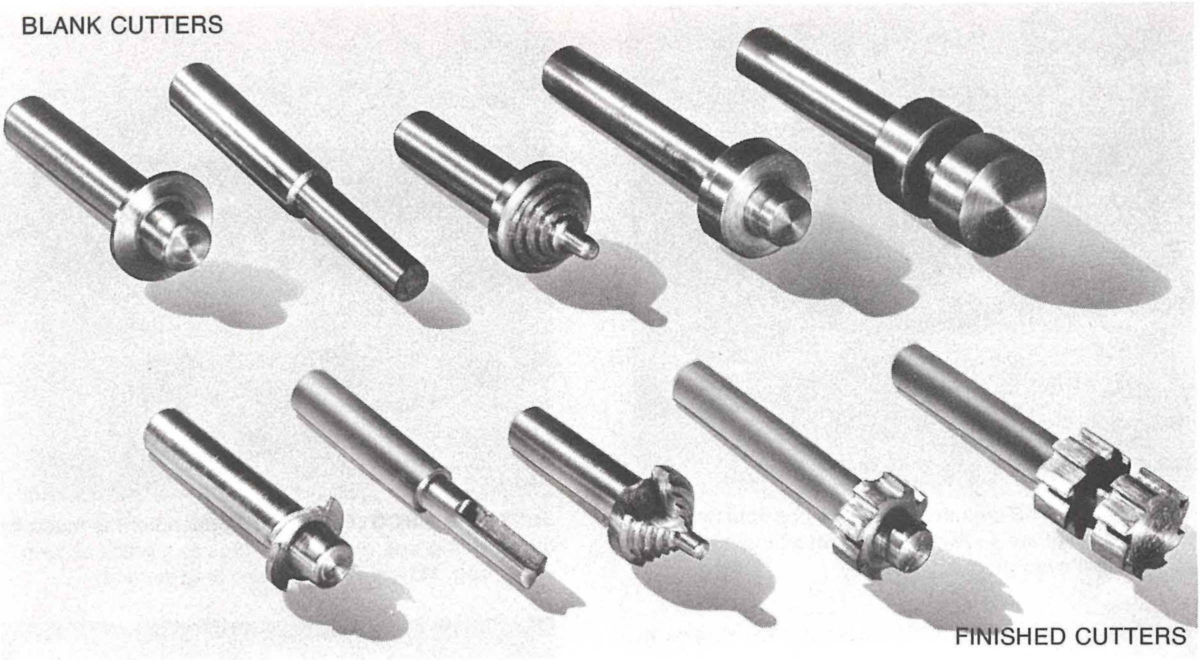
Clamp the two pieces you have cut to one end of the adjustable tongue and drill through all pieces at one time with a No. 20 drill. Space these holes 1⅜ in. on center. Thread the holes (10-32) in the tongue and *one* piece. Ream out the remaining piece $^3/_{16}$ in. and countersink for a flathead bolt. This piece is to be butt-welded to a section of ½-in. angle iron to form the slot-cutting attachment.

For the center pin of the "dial-a-jig" fixture and circle pivot, thread the end of a $^3/_{16}$-in. rod so that when it's screwed into the tongue, it will tighten without extending through the tongue. Slot the end of this pin with a hacksaw.



TO ROUT circular segment, move the jig instead of the router. Drawing (below) shows the jig's simplified construction and how its parts go together.





Make rotary cutters for your router

By WALTER E. BURTON

■ NO MATTER how many small router bits or similar rotary cutters the home shop may boast, there are occasions when an off-beat type is needed but not available from normal sources. Often the shop owner can make the needed cutter.

Determining the precise size and shape of a cutter, as well as the form of the teeth, must be worked out. Often store-bought cutters can be used as guides, especially with respect to tooth shape. For cutting wood, a tooth preferably should have considerable rake and be formed by surface meeting at a rather sharp angle; for cutting brass there can be little or no rake.

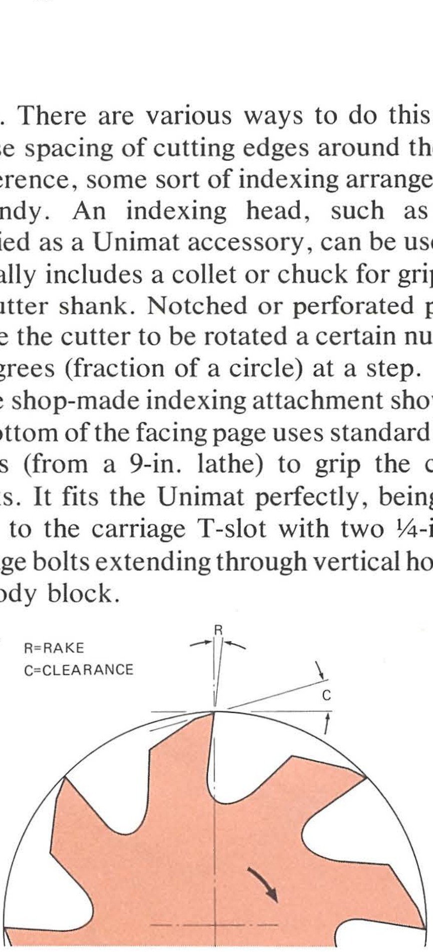
Making the blank. All cutters shown have ¼-in. shanks. The two-flute, router-type bit was made from ¼-in. drill rod, the others from ½-in. drill rod turned down. To form the cutter contours, I simply ground the lathe bits to the appropriate shape.

Forming cutter edges. After the cutter blanks have been turned to the desired contours, it is necessary to "notch" them to produce cutting edges. There are various ways to do this. For precise spacing of cutting edges around the circumference, some sort of indexing arrangement is handy. An indexing head, such as that supplied as a Unimat accessory, can be used. It normally includes a collet or chuck for gripping the cutter shank. Notched or perforated plates enable the cutter to be rotated a certain number of degrees (fraction of a circle) at a step.

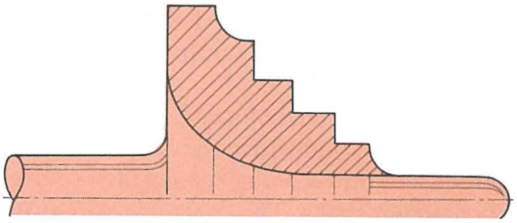
The shop-made indexing attachment shown at the bottom of the facing page uses standard lathe collets (from a 9-in. lathe) to grip the cutter shanks. It fits the Unimat perfectly, being fastened to the carriage T-slot with two ¼-in.-20 carriage bolts extending through vertical holes in the body block.

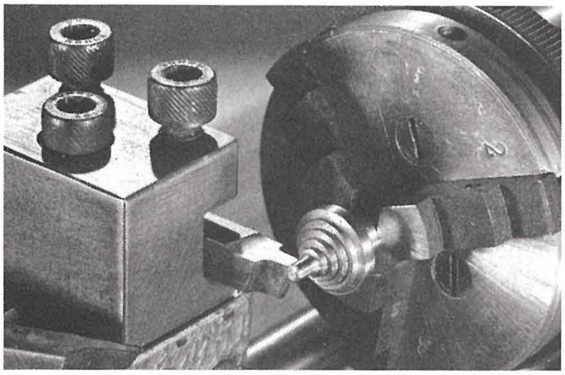
SEE ALSO

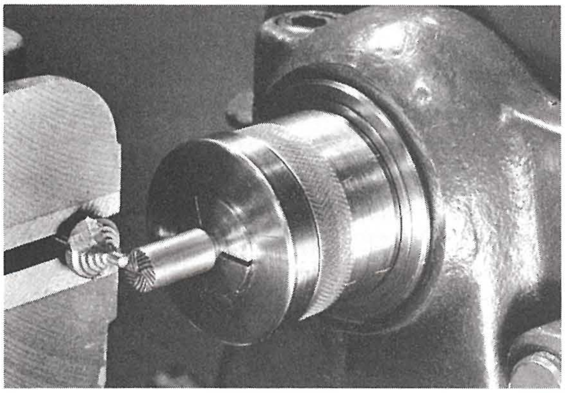
**Machining . . . Metal-lathe accessories . . .
Metal-lathe techniques . . . Routers**



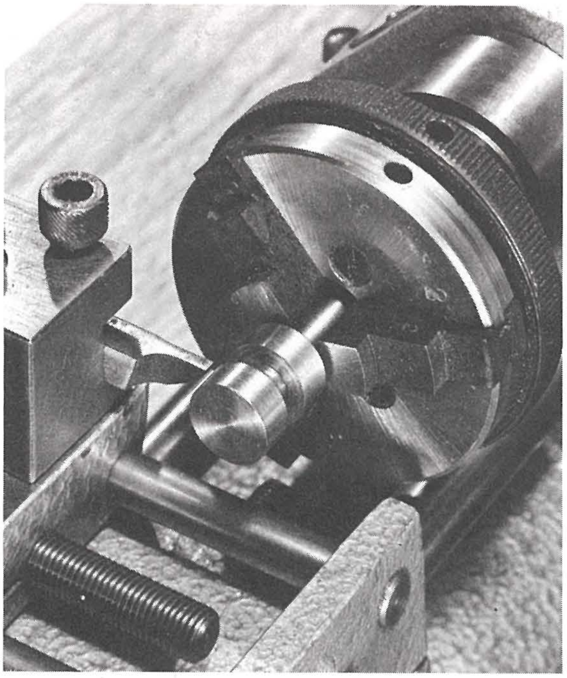
MILLING CUTTER

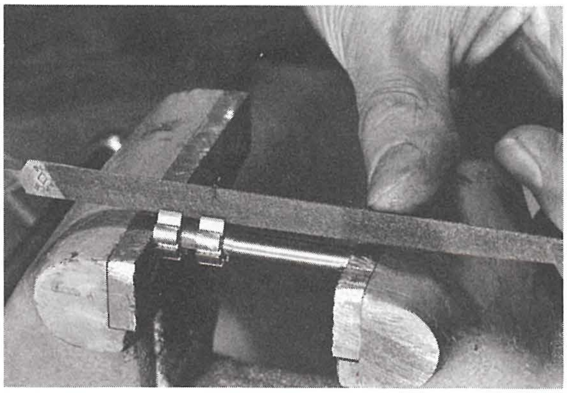

MOLDING CUTTER





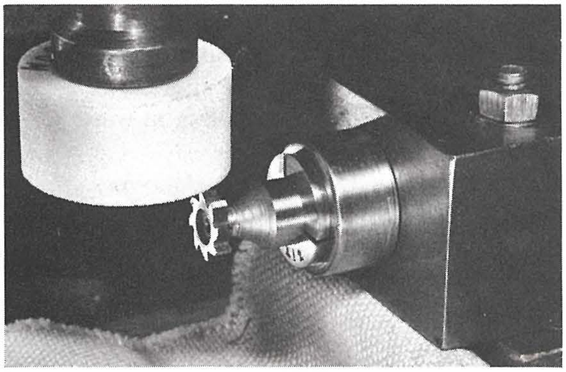
ROUND-NOSE CUTTER (top photo) forms cove grooves in special molding cutter. Square grooves were made with a cutoff bit. Photo above shows end-cutting rotary file used to mill the curved cutting notches.



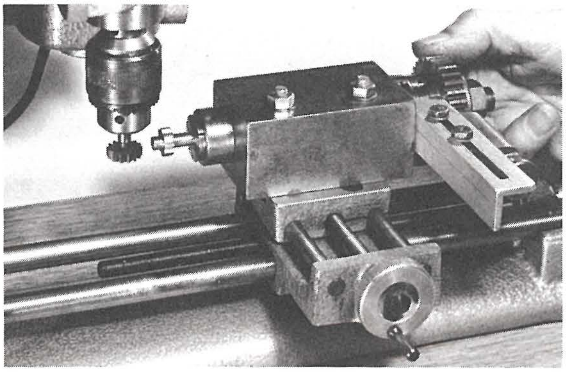


TWO-HEADED, tongue-forming cutter (top photo) was blanked out with cutoff bit, then sides of heads were dished to reduce rubbing. Photo above shows how teeth of a two-headed cutter were formed with a file.

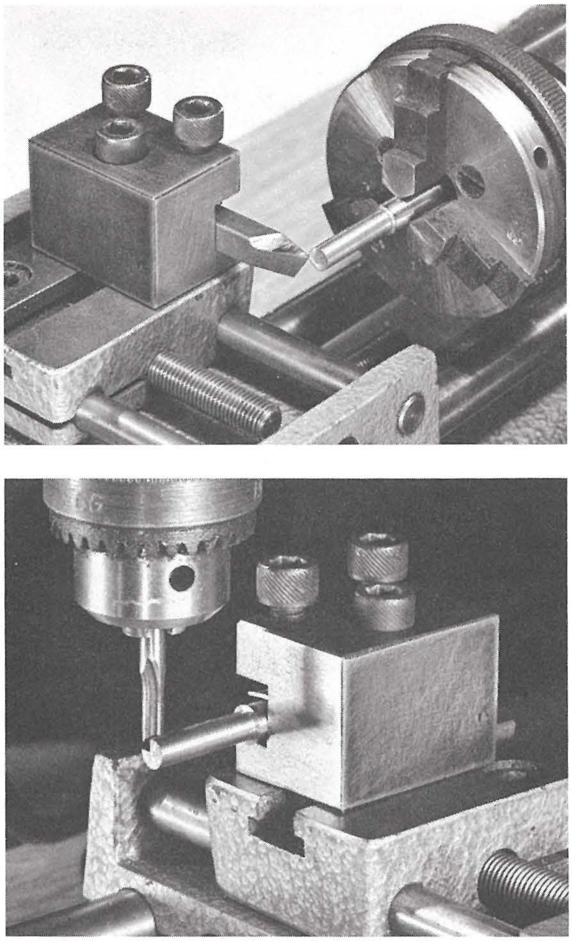
continued



UNIMAT LATHE, set up as a vertical grinder, touches up clearance on the teeth of a factory-made cutter.



WOODRUFF KEYSET cutter is used to rough-cut notches in 8-tooth cutter with aid of indexing attachment.



TWO-FLUTE router bit is being machined from ¼-in. drill rod (top) with end turned to 5-mm. diameter. In lower photo, longitudinal flutes (right-angle grooves 180° apart) are formed with blank held in Unimat tool block. Filing relieves the edges and end.

It is possible, of course, to form cutting edges without using an indexing attachment. Most cutters will work even if the cutting edges are not precisely spaced.

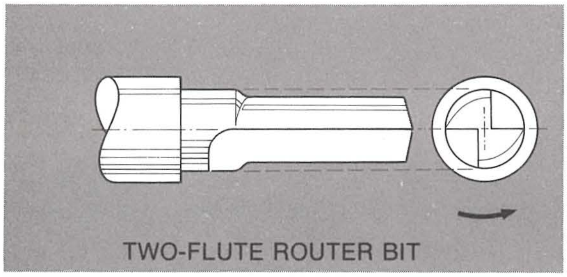
Cutting edges can be formed by milling. Here the router bit is clamped in the Unimat toolholding block and the two longitudinal flutes cut with a bit of similar shape. The conical molding cutter was clamped in a milling vise on a 9-in. South Bend lathe, and an end-cutting rotary file, operating much like an end mill, was used to rough out the two cutting edges.

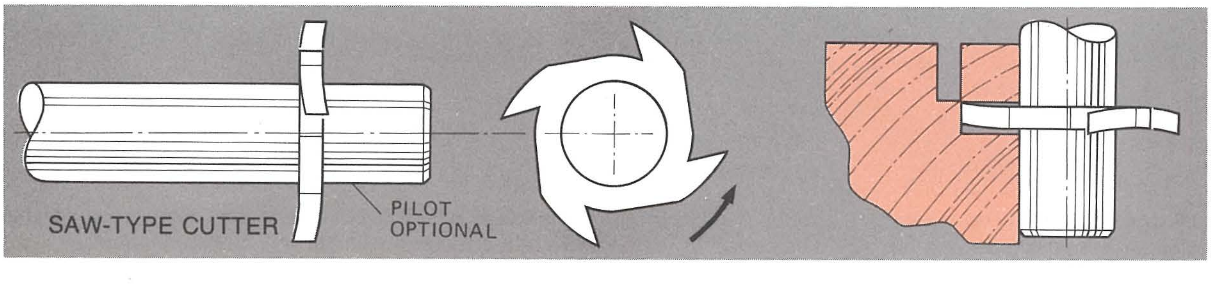
The two-headed cutter was rough-machined on a lathe with a parting-tool bit. The head was divided into eight reasonably equal parts and marked with a file. Hacksaw cuts were made to a depth of about $^1/_{16}$ in., then files were used to shape the teeth.

The little "saw" cutter has four teeth, two being filed like the teeth on a crosscut saw, one set slightly toward the shank and the other toward the tip to provide clearance. The other two teeth were filed like those on a rip saw, and similarly set. Teeth were positioned by first marking saw slots 90° apart.

Tooth shape. After a cutter has been turned and the teeth approximately formed, it is necessary to provide relief by removing metal behind each cutting edge. At the same time, it generally is desirable to remove metal from in front of each edge, so the edge will strike the work with more of a shearing action. If suitable milling cutters (or grinding wheels) are available, these operations can be performed at the time the blank is notched. Otherwise, the tooth can be shaped by careful filing and smoothed with abrasive stones, or by grinding. If you intend to finish-grind the cutter after hardening, sufficient metal should be left during other forming operations.

After a cutter has been shaped, except for final touch-up with a grinder, it is hardened and tempered. For ordinary high-carbon drill rod, hardening can be done by heating to a cherry red, quenching in cold water, polishing a "test" area, reheating until the polished spot turns a light yellow (straw) color and cooling in water.





A better rug hook

By JOHN BURROUGHS

■ IN COLONIAL DAYS, when rags were too valuable to discard, housewives scissored them into ¼-in.-wide strips and hooked them into rugs. The cloth strips were drawn up through a burlap backing, loop by loop, with a rug hook to form a thick pile.

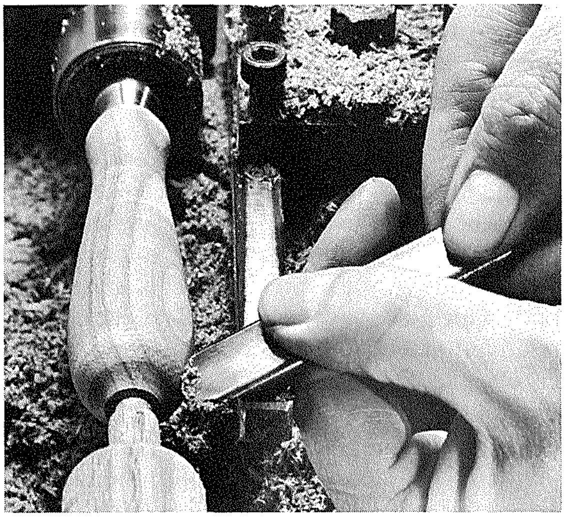
You can buy such a hook at a department store for around $5 to $10. But a really good one is a rare tool. One that's designed for the purpose will make the job easier. Happily, you can make it yourself.

A well-designed rug hook should have a tapered shank so that when the hook is pushed through the monk's cloth the shank will spread the weave enough to permit pulling the loop of rag strips or yarn through readily. The hook itself should have a smoothly rounded barb, and the tool should have an easy-to-grasp handle.

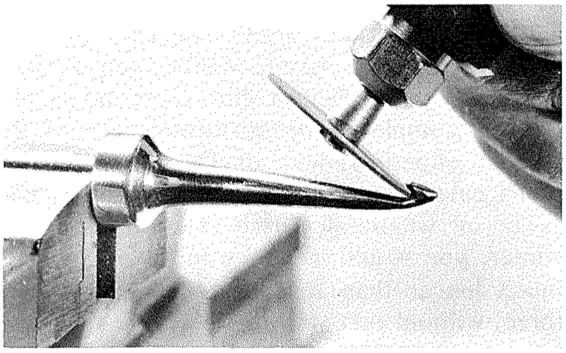
With a little shopwork you can make up a tapered-shank hook of this kind quite easily. The one pictured was turned from a ½-in. stainless-steel bolt. The barb was shaped with a small file, and when polished, the hook was set in a turned walnut handle.

If you lack a metal lathe, you can grind your hook to shape, first rough-grinding with the work hand-held and then finish grinding while the work is chucked in a portable drill. After filing the hook barb, polish with a strip of abrasive paper and buff the steel shank smooth.

TURN THE HANDLE from seasoned walnut and drill lengthwise for the hook before removing it from the lathe.



SHAPE THE HOOK with a small, three-cornered file, round out the gullet with a hand grinder and polish.



SEE ALSO

Bottle craft . . . Internal carving . . . Jewelry . . . Lapidary . . . Marquetry . . . Plaster casting . . . Potter's wheels . . . Velvetizing

Rust—your car's worst enemy

By MICHAEL LAMM

▪ IN A RECENT YEAR, rusted-out cars cost motorists an estimated $5 billion. In everyday terms, the average tab came to $100 per car that year.

Today, with nearly twice as much road salt being used, and taking inflation plus the higher price of cars into account, it's safe to call auto-body corrosion a $7.5-billion-a-year blight. At $7.5 billion, it puts the average cost to each of us who drives a car at $150 a year. In localities where cars rust quickly, the cost is higher; in low-rust areas, of course, it's lower.

If $7.5 billion seems a mind-boggling figure, keep in mind that the cost of muffler replacement alone ran to $675 million in one recent year. And the $7.5 billion represents only the dollar cost of the rusted-out cars themselves. It doesn't cover the toll in accidents caused by leaky mufflers, punched-through floorboards, burst steel brake lines, ruptured spring towers and general structural collapse. It also doesn't take into account the medical expenses, time off the job and the deaths caused by auto-body corrosion. Because, acknowledge it or not, car cancer does kill people, just as surely as any other kind.

no one seems to care

I go back to Detroit about once a year, and it always amazes me to see so many Swiss-cheesed hulks running around. It strikes me as ironic that here in the city that produces all those shiny new ones, people put up with the cost, the danger and the ugliness of rust buckets as their own private transportation.

Detroit's clunkers aren't *old* cars by any means. If anything they're middle-aged. By age five, many cars in Detroit show spots and panels that are completely rusted through. James B. Garvie, superintendent of Detroit's Vehicle Management Div., told me, ". . . in an area such as Detroit, where salt is used on the streets every winter, you would be lucky to have a car go much longer than four years, possibly even three, without rust starting to show."

SEE ALSO

Autos, body care . . . Autos, repair . . . Lubrication, auto . . . Torque wrenches

In 1951, the average lifespan of an American automobile was 13.5 years. Today, the average lifespan hovers between nine and ten years. Why?

One member of the auto establishment told me flatly: "Detroit has a vested interest in rust. The more cars rust, the more new ones get sold." He asked not to be identified.

What gets me about the auto-body corrosion calamity isn't the $7.5-billion-a-year cost, although that bothers me, too. It's the meekly accepting attitude of the American public. Why isn't anyone hollering? Why isn't the Department of Transportation all fired up? Or the Department of Health, Education and Welfare, since this is a health problem? Or the Office of Consumer Affairs, since it's costing consumers all that money? But no one's saying a word. And it shouldn't even *be* the bureaucrats—it ought to be the motorists themselves who yell, "Stop! I've had enough of trading cars every three years, I'm not going to put up with rust any more!"

Naturally it's not that simple, because it's usually not the person who bought the car new who has to put up with the rust. He sold it at age three; the actual problem of corrosion falls to subsequent owners. It's the little guy who inherits the rust, and poor people have neither the time, money, nor political clout to protest.

why all this rust?

Thirty-five years ago, cars used not to rust, or rusted very little at least. It's interesting to trace how corrosion turned from a relatively minor problem into a very major one.

You know the old saw, "They don't make 'em like they used to," right? Well, it's a fact. In many ways, of course, cars are better today, but the old Model A Ford (1928-31) used sheet metal 0.048-inch thick in its fenders. Model A's body gauge was 0.040 inch. One reason you still see so many Model A's around is that their fenders and body were *built,* and the fenders in particular had relatively smooth under surfaces—no pockets or crevices to catch and hold road splash.

From the mid-1930s through the 1950s, sheet metal for automobile bodies was a pretty consistent 0.037 to 0.040 inch. Recently, though, and especially in small economy cars like the Pinto, Vega and many imports, sheet-metal thickness has dropped to 0.032 inch. In some imports like the Toyota it's as thin as 0.029 inch. So we're down from 0.048 on the Model A fender to nearly half that in several imports. And 0.029 inch is just over three times the thickness of a common soup can.

Now you say, "Well, steels are better today—technology is better." I'm afraid not. Today's steels are about the same, and the new technology of rust prevention, such as it is, simply tries to compensate for the loss of metal thickness and fights an uphill battle against air and road pollution.

Consider these added factors speeding auto-body corrosion:

1. Cars with separate frames can stand up under body rust better than cars with unitized bodies. That's because the frame members are thicker—heftier—than sheet metal, so while doors and fenders might look like lace curtains, the frame is still holding the car together.

In cars with unitized bodies, though, there's no separate frame. Unit bodies rely on box sections and gusseting for rigidity. The actual sheet metal used in some of these boxes and gussets, however, is much the same gauge as the outer skins. So since the boxes tend to trap moisture and salt, they're given to rusting just as quickly (more quickly in some instances) as door bottoms, fenders and quarter panels. In other words, unitized bodies can and sometimes do simply collapse from corrosion. *Most U.S. and imported small cars—subcompacts, compacts and ponycars—use unitized body construction.* They're unitized, inexpensive, and supposed to be economical, so their engineers trim weight and cost by specifying thin-gauge sheet metal.

2. The two main causes of rusting—road salt and air pollutants—have increased tremendously in recent years. As the graph shows, municipalities and highway districts are using seven to nine times as much salt as they were in 1955.

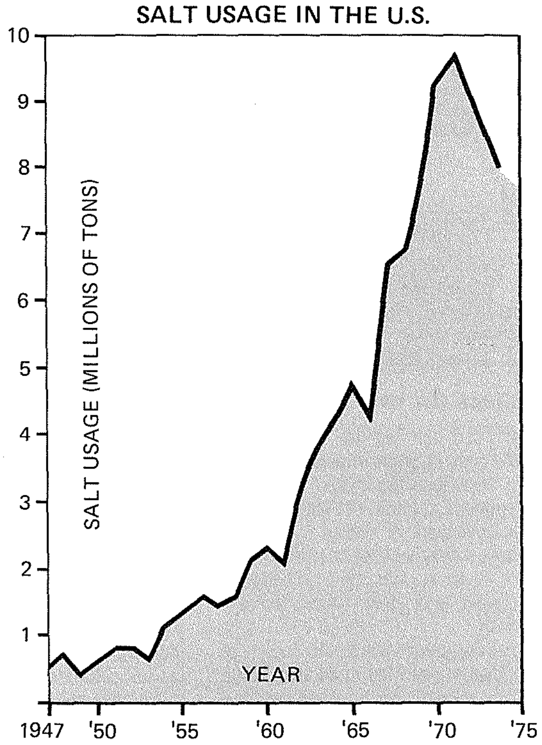
Salt companies currently sell nearly 10 million tons of road salt every year—and I mean they go out and aggressively *sell* it. It's been shown that the amount of salt bought by some of the big eastern cities has nothing to do with snowfall; also that the times when salt is spread on roads has nothing to do with snowfall intervals. Cities and state agencies are simply buying salt and dumping it on roadways all winter long. It's "good business." I'm not saying that salting roads is all bad—it's not. Salting is necessary in some areas. But it's overdone. There's no need to use so much.

Why, you ask, doesn't someone invent a salt that doesn't cause corrosion? Chemists have tried, believe me, and the car companies would like nothing better. So-called "inhibited" salts have been formulated. They're expensive, and none has been shown to do much good.

Salt, in any case, accounts for only about half of all auto-body corrosion. The other half is caused by atmospheric pollutants like sulfur dioxide. This is conceded to be one of the most corrosive pollutants around and it's one of the lovely things cars with catalytic converters spew out. But other airborne corrosives also contribute: acids, metallic powders, even dust. A Swedish study concluded that heavy industrial environments make bare steel rust eight times more quickly than rural environments.

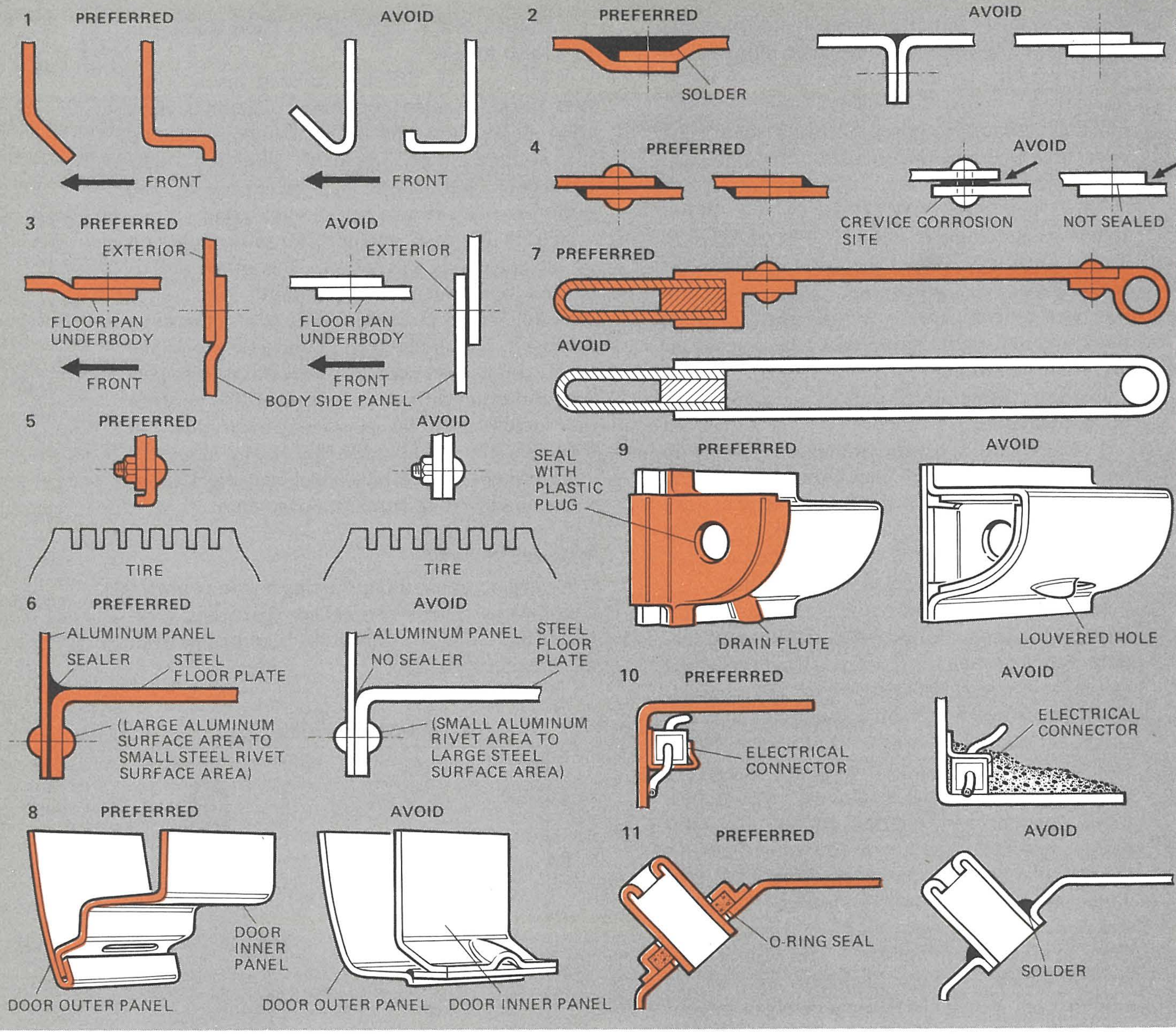
what causes rust?

A very complex thing, rusting happens in two major ways. There's so-called "galvanic" corrosion and "concentration cell" corrosion. Both work electrolytically.



THE PURCHASE OF SALT by municipalities has been rising steadily. Salt melts ice on roads to minimize skidding accidents, but heavy use contributes to car-rusting and has a negative environmental impact. So far, chemists have not developed a non-corrosive substitute.

PREFERRED DESIGNS FOR PREVENTION OF CORROSION AS RECOMMENDED BY THE SOCIETY OF AUTOMOTIVE ENGINEERS



Where to check for rust on your car

Most of today's cars use steel brake lines. Since bare steel would rust through in a few years in road-salt areas, these lines are coated with a thin coat of brazed copper and terne. But where such a brake line is scraped bare or nicked by a flying stone, the copper coating exposes the steel. What happens then: Salt spray acts as an electrolyte between the copper and steel, which actually *speeds* corrosion.

The *SAE Journal*, published by the Society of Automotive Engineers, reported in January 1966 that in salt-spray degradation of copper-brazed steel tubes, "pressure-retaining ability [is] reduced to practically nothing after 30 days exposure." In other words, within a month the rusted-out brake lines can burst during normal stopping. They usually don't, but it's possible. More to the point, a survey of fleet operators in road-salt areas said that 40 percent of their cars' brake lines showed some measure of rust damage after only two years' service.

A common, very dangerous rust zone in small unit-bodied cars happens to be the tops of McPherson-strut spring towers. Mud and road salt pack into these areas and soon they rust through.

Volkswagen Beetles have long had a corrosion problem around the battery box under the rear seat. Holes in the rear floor could let in carbon monoxide from the exhaust. Carbon monoxide entering the passenger compartment can affect any car. Mufflers and exhaust tubing rust through in a couple of years under the best of conditions. Add floorboard rust, speeded by sound-deadening mats that trap and hold moisture under carpeting and you have a lethal combination.

Tailgates on station wagons used to rust quickly, often at bottom edges after leaves and water entered at the window. Leaves clogged the drain holes, the tailgate soon rusted through and exhaust fumes were then sucked in. However, this is less of a problem now because some cars are using galvanized metal, but tailgates do still rust in some makes and models. The same is true of trunk floors in many regular coupes and sedans.

A few early Mustangs had problems with gas tanks rusting through because of a corrosive adhesive used under the trunk mat. These were "drop-in" tanks where the upper surface doubled as the trunk floor. A number of other Ford products used "drop-in" gas tanks, but the factory says these weren't affected by rust.

Less common than rusted-out doors but still known are collapsed A-arms and suspension components, broken steering linkage and carbon monoxide entry through the cowl or firewall when these are perforated.

Then, too, there are spare-tire wells that spare tires drop through, shock-absorber mounts that break off and motor mounts that can suddenly let go when rust really eats through the metal.

Galvanic corrosion needs two dissimilar metals plus an electrolyte—a fluid that conducts electricity. Suppose you have two sheets of steel held together by copper rivets. Salt spray (the electrolyte) makes a cathode of the copper and an anode of the steel. You get a reduction/oxidation reaction flow through the salt-spray solution. Pretty soon the steel around the copper is eaten away.

What about the door of a car, where there's only one type of metal—sheet metal? Can that also rust by galvanic action? Indeed it can. The sheet steel used in car bodies contains two major constituents: pearlite and ferrite. These are crystals—the pearlite is black, the ferrite, white and carbon-free. There's enough difference between the electromotive potential of the two to cause galvanic action. Thus an all-steel car body can rust all by itself, with no help from a dissimilar metal. All it needs is an electrolyte—a little impure water on its bare surface.

Concentration cell corrosion accounts for even more rusting than pure galvanic action. Here's how it works. Suppose you have a poultice of mud and road salt packed in under the unpainted surface of a fender. As galvanic corrosion takes place, free oxygen is consumed at the metal's surface. Pretty soon there's a much lower concentration of oxygen at the rust patch than there is in the atmosphere. This difference in oxygen concentration again sets off an electrolytic action, because in the absence of oxygen, metal can go into solution as cations, leaving behind two negatively charged electrons. These two free electrons move to the atmosphere, making iron hydroxide, which goes to iron oxide (rust) and water.

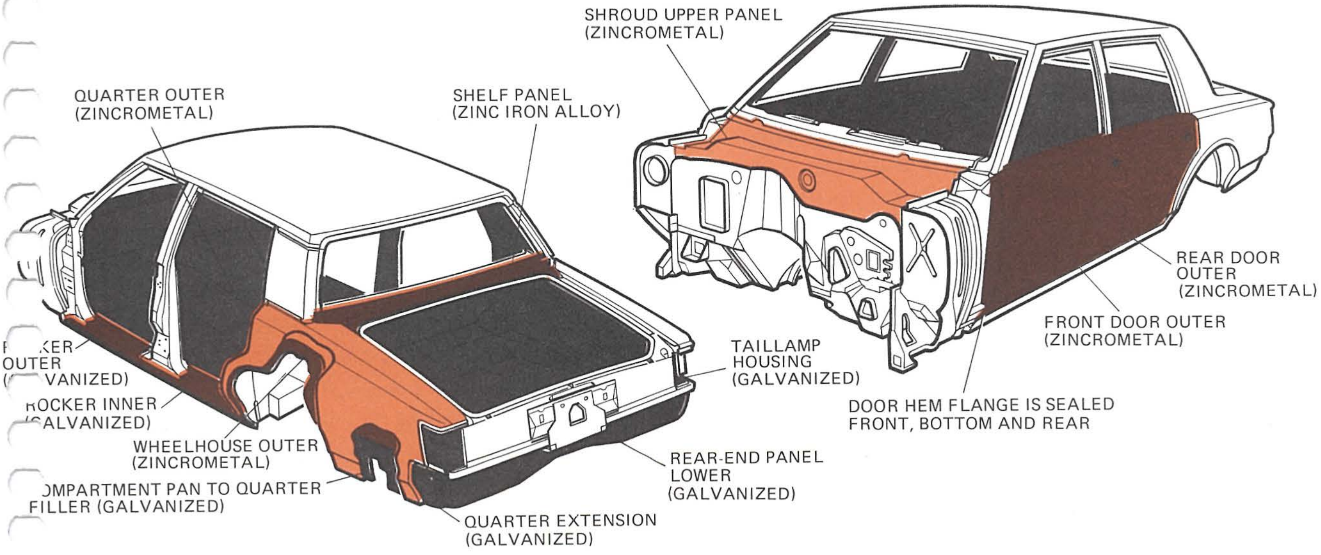
Note, though, that salt alone can't cause rusting. *Dry* salt plastered against a metal surface won't do a thing. In fact, trucks hauling dry salt inside huge salt mines don't show the slightest trace of rust. Trucks that haul away hot cinders from big coke ovens don't rust either, because the heat dries off any moisture that might become an electrolyte.

It's only the unprotected, *bare* metal that's vulnerable. Rusting usually eats its way from the inside of a car body toward the outside. Paint protects the exterior until it's scratched or nicked. Some late-model cars do tend to lose paint because of radical tuck-under, which lets the tires fling up stones that chip the finish. In those cases, rusting often moves inward as well as outward at the same time, and a panel can perforate (rust through) much more quickly.

what's being done about rust?

Talking to corrosion engineers at the major auto companies, I got the impression they were mostly frustrated. They were trying to do a good job, but the cost controllers kept slapping them down. I feel that in all but one company, the corrosion engineer amounts almost to a figurehead.

ANTICORROSION TREATMENT


SHROUD UPPER PANEL (ZINCROMETAL)
QUARTER OUTER (ZINCROMETAL)
SHELF PANEL (ZINC IRON ALLOY)
REAR DOOR OUTER (ZINCROMETAL)
FRONT DOOR OUTER (ZINCROMETAL)
R KER OUTER (VANIZED)
ROCKER INNER (GALVANIZED)
TAILLAMP HOUSING (GALVANIZED)
DOOR HEM FLANGE IS SEALED FRONT, BOTTOM AND REAR
WHEELHOUSE OUTER (ZINCROMETAL)
OMPARTMENT PAN TO QUARTER FILLER (GALVANIZED)
REAR-END PANEL LOWER (GALVANIZED)
QUARTER EXTENSION (GALVANIZED)

That's not to say they're not doing anything. It's just that they're not doing enough. The only car made in Detroit today that goes beyond the current normal standard of rust protection is the Cadillac Seville. It appears to have about twice the rust resistance of most Detroit products. That might make it 10 years away from perforation in harsh environments instead of the usual five.

The corrosion engineer's arsenal of antirust weapons sounds impressive—such things as zinc-rich primers, galvanized steel, Zincrometal, spray-on plastisol vinyls, spray-in oily waxes, electrodips, plus Mortex insulation and Permagum dumdum. Indirectly, plastic grilles, molded polyurethane bumper pans and fender extensions and fiberglass pieces help combat rust.

Yet no carmaker is overly generous with any of these. In fact, they're about as stingy as they can be. So in a way, they're paying lip service when they tell you about their anticorrosion systems. They use them, but only where there's no choice.

I'll illustrate the point by citing the Vega's example. The Vega has gotten a terrible reputation as a ruster. From its inception, its front fenders would perforate within two years in harsh cities. Why? Because the sheet metal was thin (0.032 inch) and minimally protected. Didn't Chevrolet engineers know that Vega front fenders would rust out? They say no. Finally in mid-1974, three and a half years after the Vega's introduction, Chevy decided to add plastic inner liners inside the rear fenders. At the same time, the Vega wagon's rear-door outer panel became Zincrometal, and so did its quarter panels and wheelhouses.

Not wanting to risk another ruster with the Monza and its stablemates, Chevrolet and Fisher Body specified fender inner liners and Zincrometal inner fenders from the beginning.

And lest you think the Vega was unique, a few years ago Pintos also had two-year perforation problems with their front fenders. Same thing happened. The Pinto, too, got plastic fender liners after a few years of production.

Rust protection always has to be a compromise. All the automakers can do is slow down the corrosion process. They can never stop it altogether. And rust protection is a relatively new science, so many processes are still imperfect. Each contains built-in faults and restrictions.

Undercoating used to be a big thing. More recently, however, it's been shown to dry out, get brittle, stiffen, lose adhesion. When that happens, it creates pockets of moisture and salt on a car's underbody.

Zinc-rich primers (ZRP) came along around 1958, and are still widely used. They're relatively cheap and have the great advantage of weldability—you can weld through them. But ZRP used on the inner skins of doors, say, tends to flake off in some cases and erode sacrificially in others. Within about five years, either way, they're gone. Bye-bye rust protection.

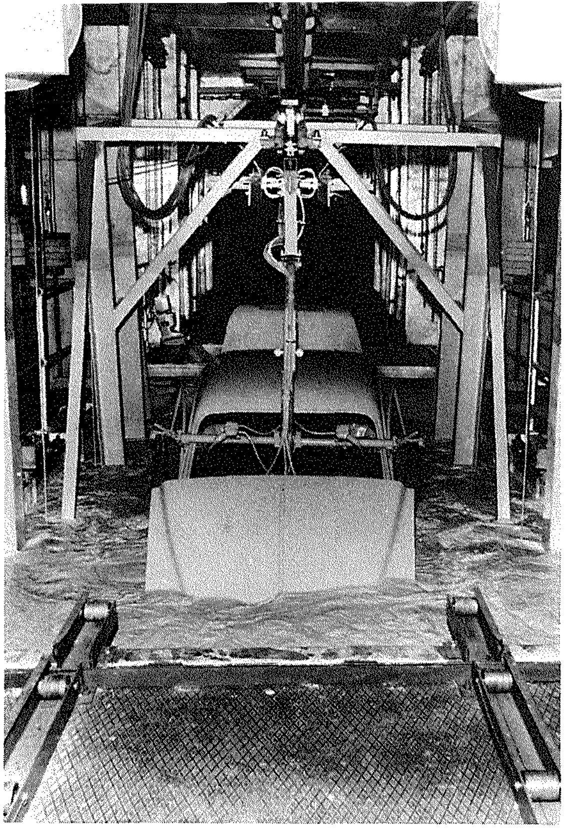
Zincrometal is one of the new names around car companies these days. It's a one-side-coated steel. The coating is baked on in two stages. Zincrometal's coated surface is designed to face inward in, say, a door or quarter panel. (Zincrometal was developed by a company named Diamond Shamrock. It is now made under license by U.S. Steel, Armco and Inland Steel and is supplied to anyone who wants it.)

Zincrometal is moderately expensive, weldable, and has only one major drawback. It scratches fairly easily. Scratched or nicked, it rusts. So it needs careful handling on the line. Zincrometal can also be stamped, but complicated dies tend to abrade it.

Two-sided galvanized steel came into common use with the 1960 Falcon. The Falcon's rocker panels were galvanized. Ford soon found that although the Falcon's fenders, doors and other panels rusted as quickly as ever, its rockers looked new after five years on the road, and they showed very little rust even after eight. Today, the average Ford product contains 170 pounds of galvanized steel. GM uses roughly 100 pounds per car; Chrysler and AMC approximately 72 pounds.

But why, you ask, isn't galvanized used even more widely? Three reasons: It's relatively expensive, can't be formed into complicated shapes, and its "spangles" show through paint. Galvanized spangles are those starbursts you've noticed on rain gutters and trash cans. In out-of-sight places like rocker panels, the painted-over spangles aren't too noticeable, but higher up on a car body they are. All unitized cars now use galvanized rockers, and some use galvanized steel in hidden areas like cross members, spring towers, cowl plenums and engine attachment points, where looks don't matter.

Ford and the Budd Co. are beginning to use spray-on plastisol vinyls along body seams and in rust-prone areas under hoods, deck lids and so forth. This is a vinyl polymer with good adhesion, offering good protection. Fiat goes even



ONE PROCEDURE used by Saab is to dip car bodies in an anticorrosive primer bath before painting.

farther with vinyl sprays and does up the whole undersides of rockers and valance panels so they totally resist water. So far, though, GM, Chrysler and AMC aren't sold on vinyls. One engineer told me there's reason to suspect that somehow hydrochloric acid forms around the vinyl spray patch. If that's so, it could cause more corrosion than the vinyl prevents.

Another anticorrosion weapon is an oily wax, sometimes called Nox-Rust, that all carmakers now use. It's sprayed into door hollows, quarter panels and hidden recesses with a long wand, much like the guns used by Ziebart and other aftermarket corrosion fighters. This wax varies in color from oxblood to aluminum. It does a good job, but creates two problems: It clogs drain holes in door bottoms and similar places, and a sloppy operator tends to miss spots. Quality control has to be watched.

Why don't the automakers give their cars a Ziebart-like treatment right at the factory? Several reasons, say body engineers. First, there's a housekeeping problem—the sprayed-in goo drips and oozes out of pores for about 24 hours, leaving the plant a mess. Second, a car can't go through the paint ovens after treatment, because the asphalt-based material would melt. That's what the factories say, but they don't tell you both problems can be solved. The fact is, they don't want to asphalt-inject inner surfaces. Cars destined for low-rust areas don't need it. So, the factories leave it to local dealers in high-rust areas to spray in anti-corrosives as the market demands.

what's the car cancer cure?

What, then, is the overall answer to the car cancer problem? Is it hopeless? Do we simply give up and recognize that cars will rust in harsh environments? Or do we fight?

We fight, of course. I mentioned the Cadillac Seville as going beyond the norm in corrosion protection. The Seville, though, should *be* the norm, not the exception.

Fisher Body corrosion engineer Ted Lasko emphasizes that primers, sealers and coatings have to be used as systems. "For example, take the Seville door. We have Zincrometal on the door panel there. But that's not the only thing that's protecting the inside of that door. We have a triple system—the Zincrometal, electrophoretic paint on top of that, plus a third coating of wax material sprayed into the bottom cavity of the assembled door, where 99 percent of the corrosion takes place."

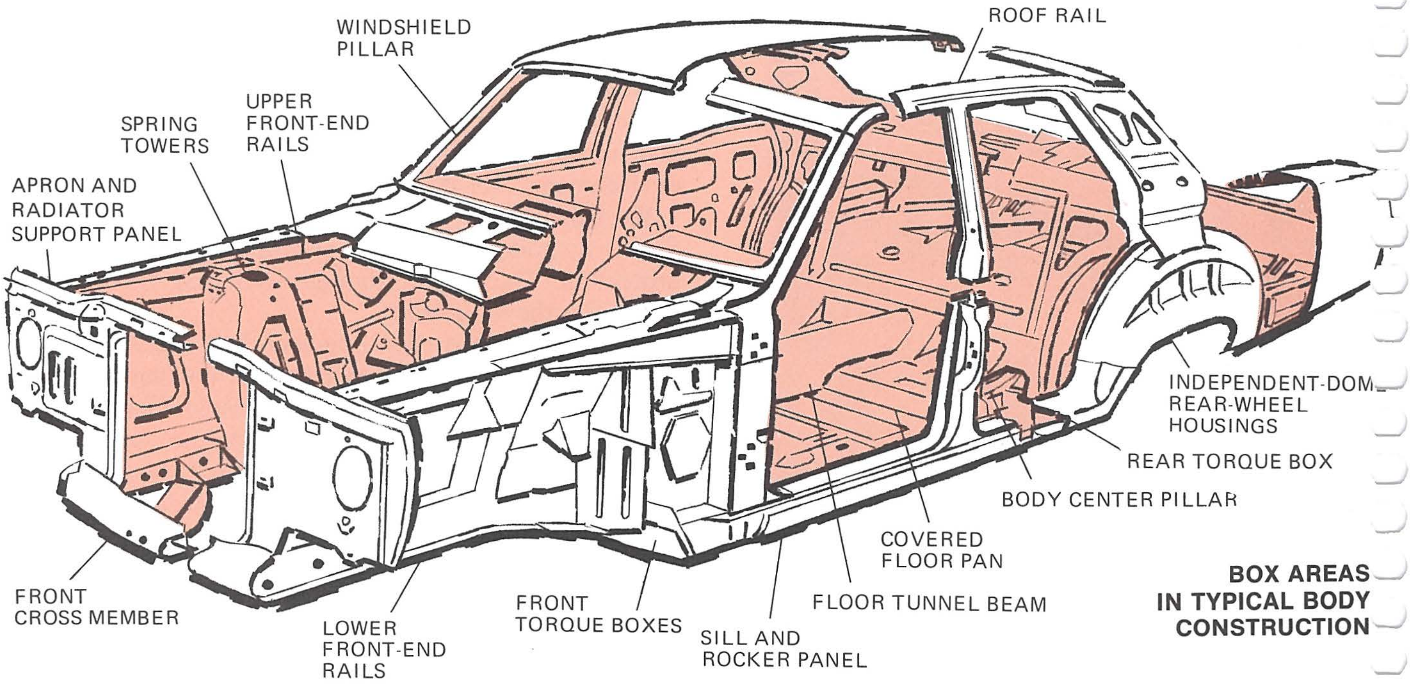
Most American cars fall between the extremes represented by the Seville on the one hand and the early Vegas and Pintos on the other. Detroit has the technology—the Seville proves that. But Detroit feels it doesn't have the responsibility to prevent rusting: it says, "Well, a lot of cars live in areas where rust isn't a problem."

They figure, too, and rightly so, that the public accepts cars that rust, so why bother? It's true, of course, that there's never been a public outcry—even sotto voce—against rusty cars.

The shame of all this is that good anticorrosion engineering isn't all that tough. An engineer who cares can stave off rust in a very inexpensive way—by simply following the good practices put forth in an SAE (Society of Automotive Engineers) report called *Prevention of Corrosion of Metals*.

This SAE report details, among other things, choices of metals for specific applications. It tells how to lap joints so they're watertight and self-drying. It suggests ways to protect welds and flanges, how to make drains that don't clog, how to avoid or seal box sections and dozens of similar trade tricks. It's amazing to see how often these tricks are ignored, even if they'd cost nothing or almost nothing to implement.

The second way to sidestep rust happens to be more expensive, but it's necessary all the same. Corrosion engineers simply have to specify more rust-preventive metals, primers and sprays. They cost, but in the long run they're worth it.



BOX AREAS IN TYPICAL BODY CONSTRUCTION

RUSTPROOFING isn't an option at Detroit: You have to go elsewhere for real protection of boxed areas.

Should you rustproof your new car?

By ROBERT LUND

Rustproofing can add years to the life of your car. But it's not for everybody. It depends on where you live and how long you plan to keep the car

■ BEFORE WHEELING onto the driveway with your new car, you might consider spending another $135 to $175 to have it rustproofed.

But whoa! Before hotfooting it out to have the job done, you should know that rustproofing isn't for everybody. It could be a smart move or money down the drain, depending on where you live and how long you keep a car. You have to decide, and to do this, you have to know what rustproofing is and isn't. Let's take the "isn't" first.

Rustproofing isn't undercoating. That's a common misconception. Undercoating consists of spraying an asphalt material on the underside of the car.

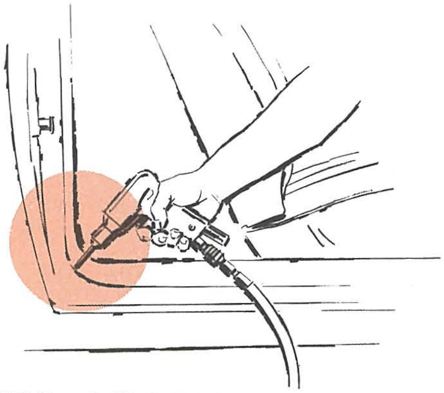
Undercoating provides some protection against rust. But not much. Imagine eight guys trying to fend off the rain with one umbrella and that's about as much antirust protection as you get from undercoating. Undercoating doesn't get in the seams and the hollow pockets of the car. But it does provide a degree of surface protection.

If undercoating's such a nothing, why do the auto companies still offer it? Undercoating does a good job as a sound deadener. It reduces rattle and road noise and provides minor protection against external corrosion.

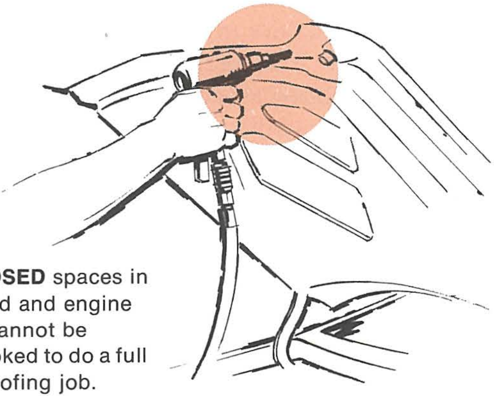
SEE ALSO

Autos, body care . . . Autos, repair . . . Lubrication, auto . . . Torque wrenches

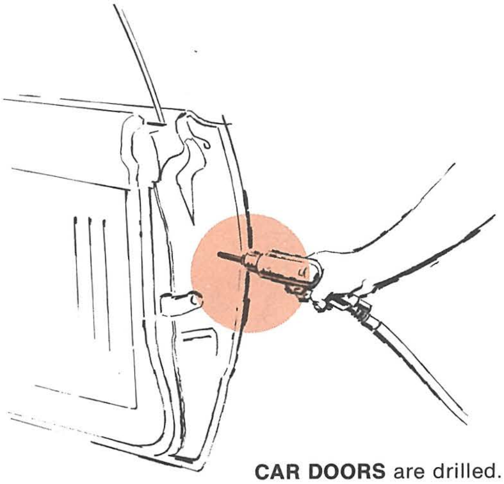
DRILLING ACCESS HOLES



ROCKER PANELS and sill always are given thorough consideration.



ENCLOSED spaces in trunk lid and engine hood cannot be overlooked to do a full rustproofing job.



CAR DOORS are drilled. Plugs cover holes, but the drain holes are left open.

GOOD RUSTPROOFING COMPANIES use auto manufacturers' engineering drawings to determine just where the access holes should be drilled in the body.

GM and Ford no longer offer undercoating as a factory option, but GM and Ford dealers will do the job for you. In the case of Chrysler and American Motors, the factory will apply the spray before shipping the car.

You can't have your car rustproofed before it leaves the factory. You have to have it done by a dealer or rustproofing specialist.

The reason the auto firms haven't put the item in the option catalog isn't because they aren't sold on it. They don't offer rustproofing as a factory option because it's a complicated job, expensive and would add another half-day or day to the production process.

While undercoating involves nothing more complicated than spraying the underside of the car, rustproofing gets into minor alterations of the vehicle, partial disassembly and putting the parts back together.

There are no universally accepted standards as to what constitutes a good, thorough rustproofing job. But the old rule applies—you usually get what you pay for. You can get value for your money or you can get stung.

The two leading companies in the field, Ziebart Process Corp. and Tuff-Kote Rustproofing, Inc., don't see eyeball-to-eyeball on what constitutes a perfect job, but they're in general agreement. Both companies remove components to get into hidden areas and drill inconspicuous holes in sections of the car to apply the rustproofing compound.

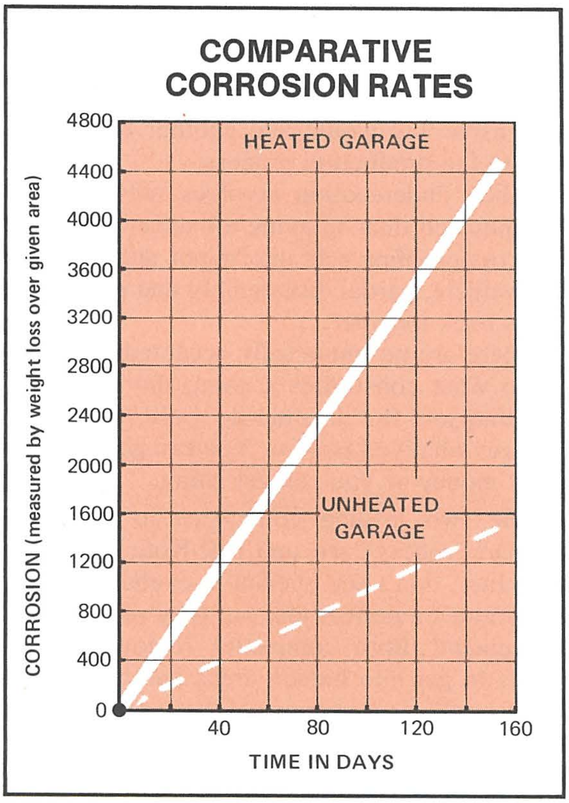
The formulas for the substances that are injected into and onto the car are secret. The material looks like a shiny thick oil or wax and has an odor like that of furniture polish.

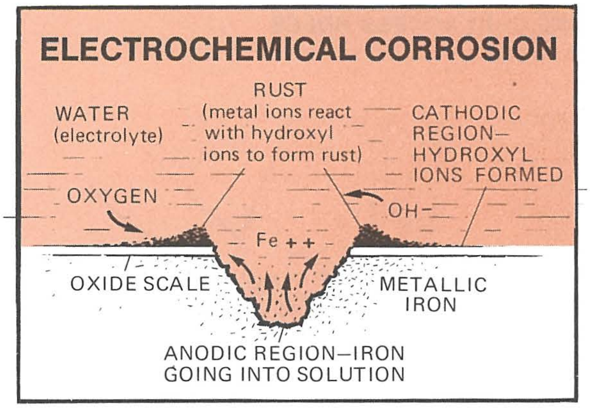
If you have the job done by Ziebart, Tuff-Kote or any reputable free lance, you'll have to give up use of your car for a day. Take it in the morning, pick it up at night. It takes awhile for the sealant to set. In addition, some of it seeps out and has to be cleaned up and all holes that are drilled to inject the material have to be plugged.

The price of the job varies, depending on the type of car—VWs cost less than Cadillacs, wagons more than sedans—and location in the United States. Car dealers and independents usually charge about $10 more than the chains.

salt air causes corrosion

You'll pay higher prices if you live in a coastal area—the tip of New England, all along the Atlantic Coast and down in the Gulf area. The reason for this is that the treatment differs depending on climatic conditions. Cars that are




ELECTROCHEMICAL CORROSION
RUST (metal ions react with hydroxyl ions to form rust)
WATER (electrolyte)
CATHODIC REGION—HYDROXYL IONS FORMED
OXYGEN
OH−
Fe ++
OXIDE SCALE
METALLIC IRON
ANODIC REGION—IRON GOING INTO SOLUTION

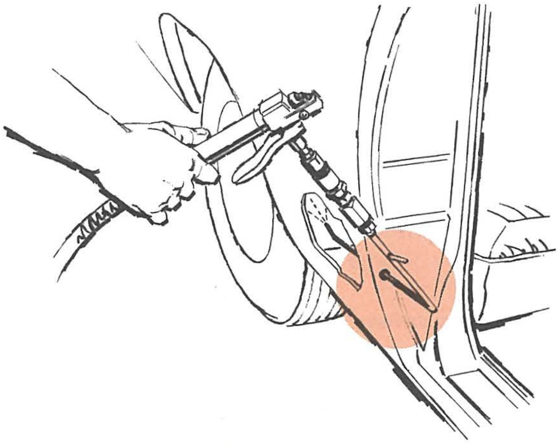
TRAPPED WATER in boxed sections starts corrosion as steel goes back to its original iron-oxide state. In winter, when trapped water is frozen, corrosion rate is low, but if you put the car in a heated garage, the corrosion rate is accelerated markedly!

exposed to salt air require a more extensive treatment than cars in the midwest snow belt. Ziebart, for example, has two types of treatments—tropical and semitropical. The tropical treatment covers cars in the coastal regions and includes a special treatment for the roof. The semitropical treatment is used inland, where cars have a tendency to rust out below the beltline.

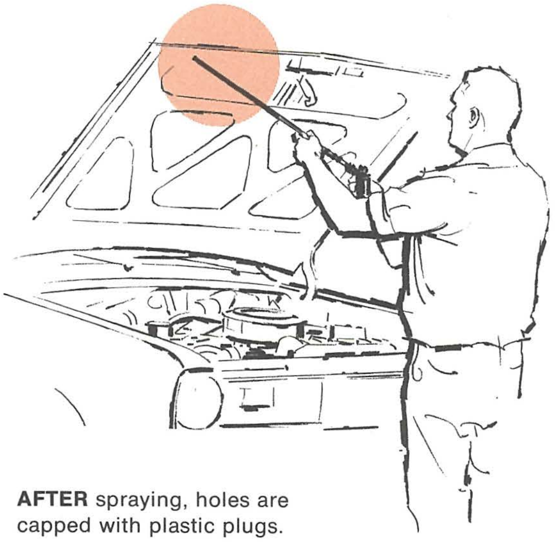
You can have your car rustproofed anytime, regardless of age or condition. But if you've had the car a year or two, giving the corrosion process a chance to start, rustproofing won't correct the cancer once it sets in.

Tuff-Kote has introduced a rustproofing ser-

CONTROLLED SPRAYING



SPECIAL nozzles spray rust preventive.



AFTER spraying, holes are capped with plastic plugs.

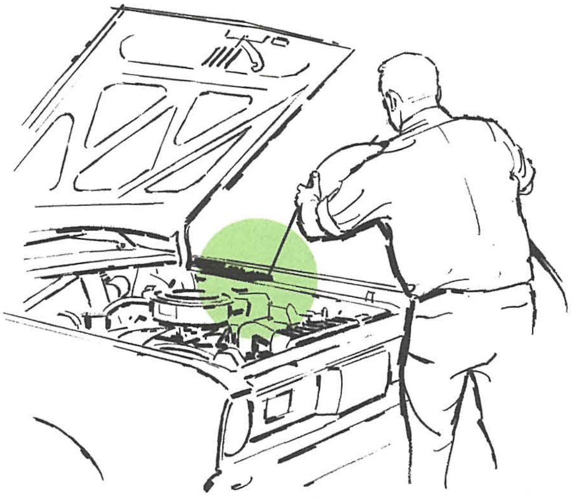
vice for used cars already showing signs of corrosion. The company says it uses material that eats through accumulated corrosion, then bonds itself to the metal. The rust is still there, but it won't spread. If you go for this treatment, you might want to have some body work done before the rustproofing is applied.

Ziebart, Tuff-Kote and the other square shooters in the business have a cutoff point when they'll accept a new car for rustproofing and guarantee the job or give a full guarantee. The rule of thumb is that the car shouldn't be more than three months old. There are exceptions both ways. Older cars they'll accept and newer cars they'll reject.

New car to you doesn't necessarily mean new car to the rustproofer if he has to guarantee the job for five years or 50,000 miles. A car can have fewer than 100 miles on it and be turned down for rustproofing if you want the guarantee. If the dealer had the car in inventory a long time, sitting on a lot where it was exposed to salt spray, cinders flying off a train or gunk from a factory chimney, an honest rustproofer will be reluctant to do the job and give a guarantee against rust-out. The damage already has been done, it doesn't matter what the odometer may say.

How good is the guarantee? The standard guarantee is for five years or 50,000 miles. But with reservations.

Both Ziebart and Tuff-Kote require that you bring the car back for a checkup after two years or 20,000 miles to keep the guarantee in force. You may have to pay a nominal fee—usually under $10—for cleaning the car, inspecting it and injection of additional rust-inhibiting compound in areas that need it. There are exceptions to the 5/50,000 guarantee. In Hawaii, for instance, the guarantee may be reduced to three to four years because of the problem encountered there with salt spray.



EXTERNAL AREAS that are rust-prone are also coated.

do you need rustproofing?

While rustproofing's a good deal for many car owners, don't plunk your money down if you don't need it. If you live in an extremely dry area or in a state that's relatively free from industrial fallout, then you can get along without having your car rustproofed.

How do you know if you live in a safe area? Check the ads in the papers and phone book to see how many shops offer a rustproofing treatment. If there aren't many businesses selling the service, that's because rust isn't a big problem in those areas.

The biggest surprise that turned up in gathering information for this story is that rust isn't a big problem in California, except along the coast and on the northern tip of the state, despite all you hear about air pollution in that part of the country. Most of the state is dry and few cars suffer from corrosion. Obviously, this doesn't apply to San Diego, Los Angeles, San Francisco and where California borders Oregon.

You may want to think twice about having your car rustproofed, even if you live in an area where corrosion is a serious problem. How long are you going to keep the car? If you trade cars frequently—every year or two—the rust problem, if one should develop, will transfer to the next person who buys your used car.

The response to this pass-the-problem-on thinking from the rustproofing companies is that you'll realize more from the sale of the used car if you have it rustproofed. Well, maybe. If you sell the used car to an individual, you'll get part of the money back that you put in rustproofing. But dealers and used-car lot operators won't give you much of a shake just because a car's been rustproofed. They'll use the rustproofing feature as a plus to resell the used car, but they don't allow much for it when the shoe's on the other foot.

Ziebart makes an additional point—and it's a valid one—that there's a safety factor in having a car rustproofed. With a rustproofed car, you're less likely to have an accident due to corrosion of such critical parts as the steering mechanism, electrical wiring, brake lines and the gas line.

For versatility you can't beat a sabre saw

▩ AS JIGSAWS, sabre saws aren't really very satisfactory. But as general-purpose power saws for cutting off lumber and ripping panel stock—the kinds of jobs that used to be done with arm-powered handsaws—the tools just can't be beat. Although sabre saws aren't as fast cutting as portable circular saws, they're lighter, easier to handle, safer and more versatile.

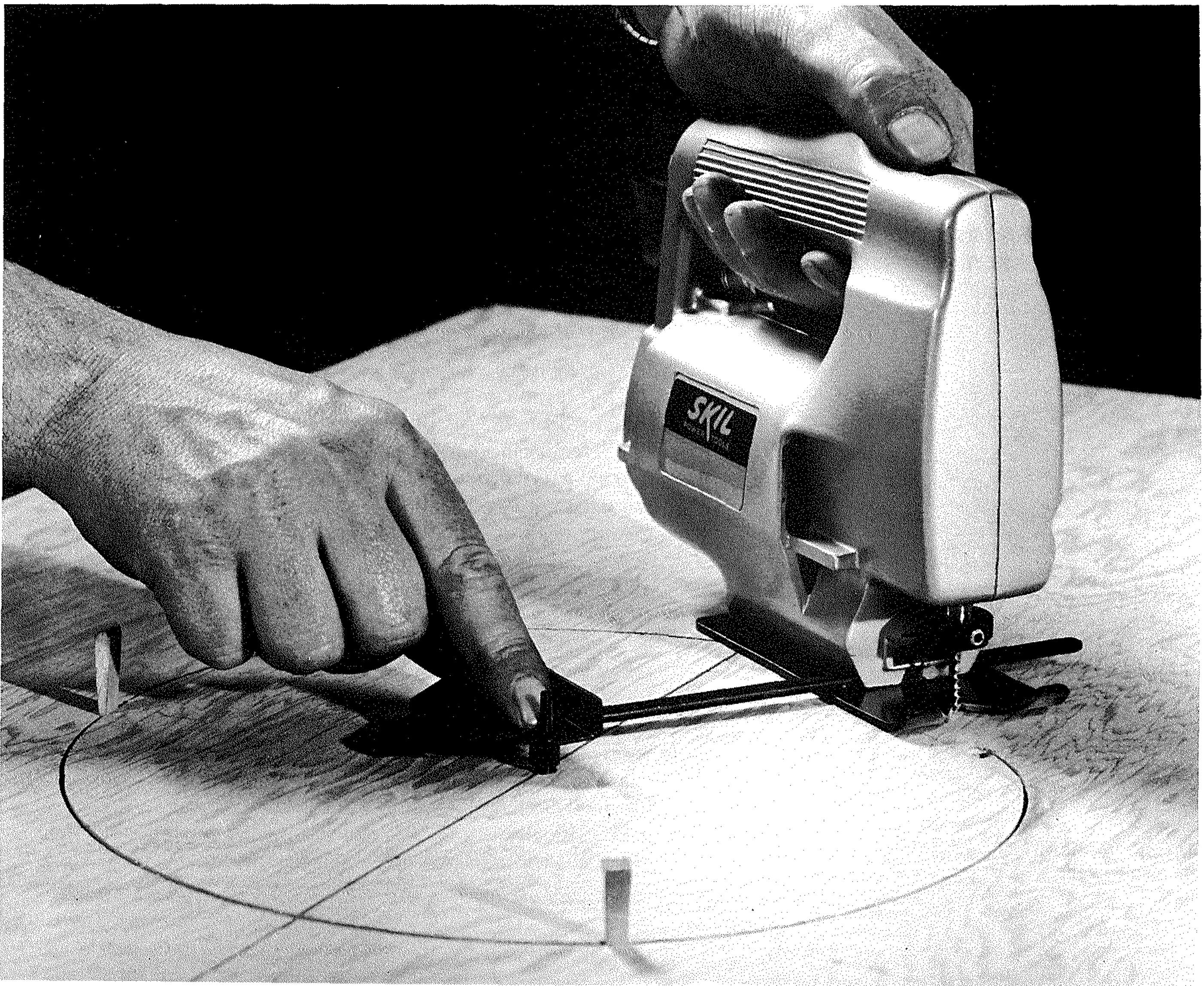
Their versatility has made them so popular, particularly with homeowners who don't have table or radial saws, that there are now more than 20 makes of sabre saws available, and most manufacturers offer several different models—in all, a good many saws to choose from.

All are similar mechanically. In each a brush-type, universal motor pinion-drives a reduction gear that has an eccentric stud. The stud operates a reciprocating saw bar with a chuck to hold a

SEE ALSO

Bench saws . . . Circular saws, portable . . . Jigsaws . . . Power hacksaws . . . Power-tool stands . . . Radial-arm saws . . . Table saws

WHEN SAWING A circle with an edge guide used as a trammel beam, wedge the kerf as you near end of cut.

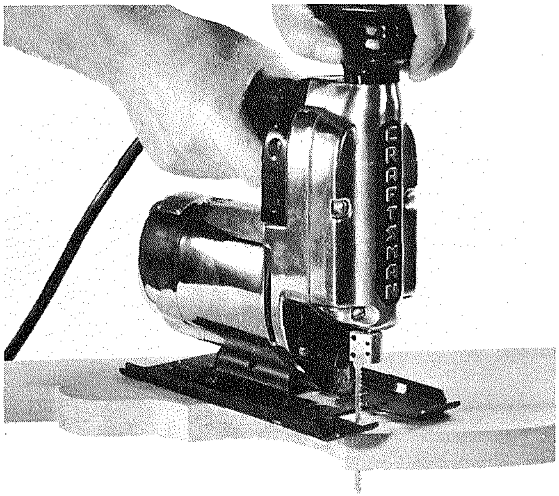


blade on its lower end. But in size, power, quality and price, the models differ widely. You can buy a sabre saw for under $10, or you can pay more than $100.

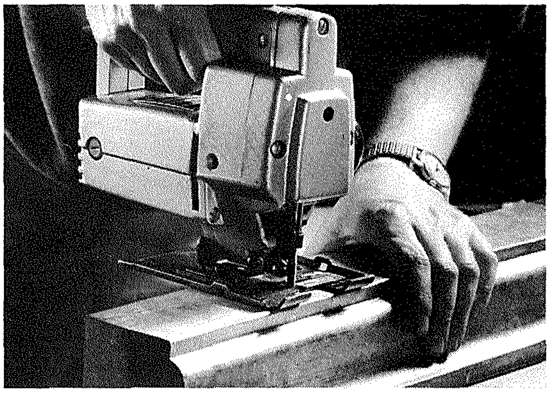
When considering which saw to buy, the real question is whether a more expensive tool's extra quality and features will prove, to *you,* worth the higher cost. The answer depends upon the work you'll do with the saw. In general, a better tool is a better buy, and for any given make, the model second from the top of the line is likely to be the best value.

- **Big or little?** Most light-duty saws with ⅝-in.-long strokes have motors that draw about 2.5 amps. and develop up to ¼ hp. Such saws readily cut 1-in. hardwood or 1½-in. softwood.

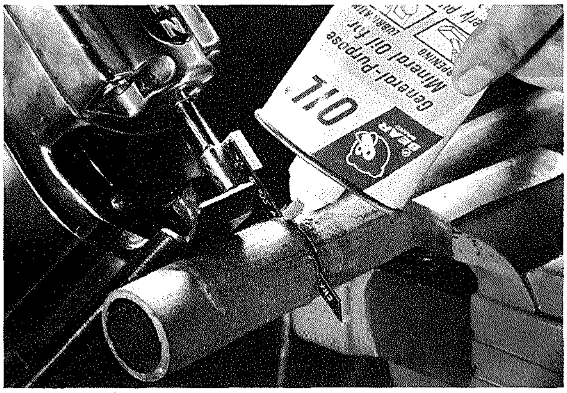
Heavier duty saws with 1-in.-long strokes have motors drawing up to about 4 amps. and developing around ½ hp. These larger tools can



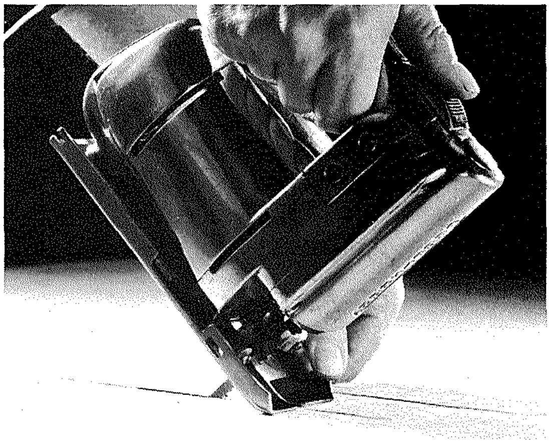
Sears' 12-speed saw has a knob for steering the blade in any direction without need to turn the saw



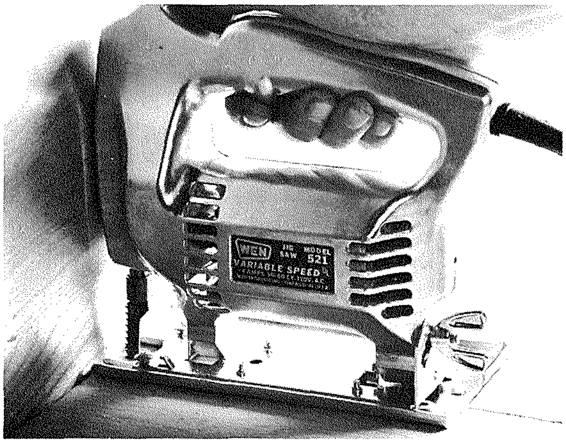
To saw sheet metal smoothly, use a 32-tooth, wave-set, metal-cutting blade with a slow, even feed



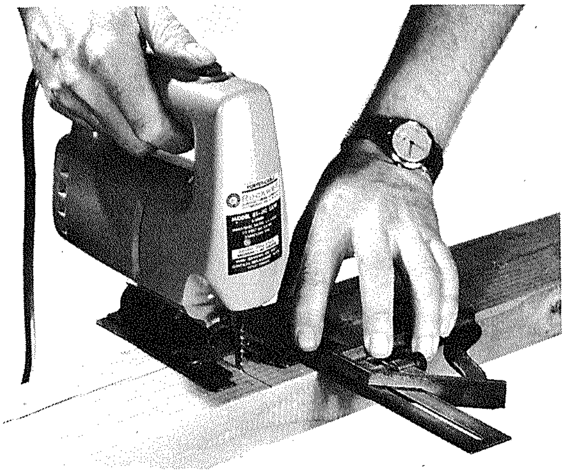
When power-hacking pipe or angle iron, use the saw's slowest speed and flood the cut with light oil



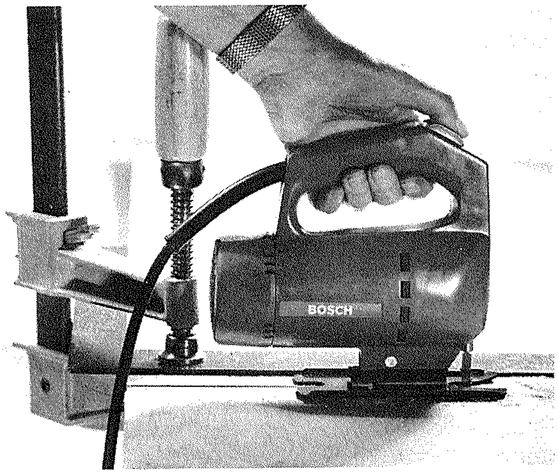
For a plunge cut, rock the saw forward, then gradually pivot the tool backward until blade cuts through



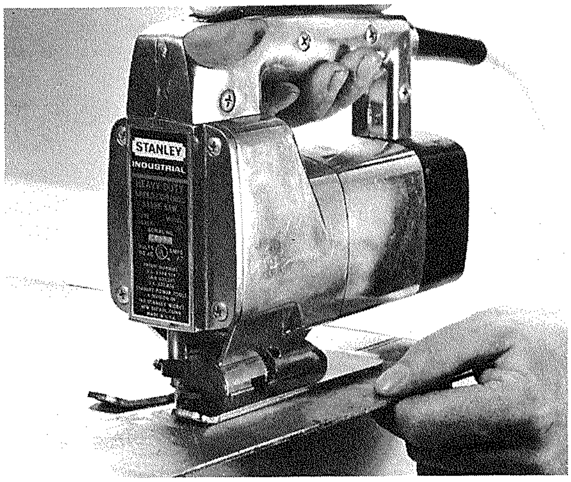
Shoes on some saws slide back to permit cutting to a wall when sawing openings for ductwork



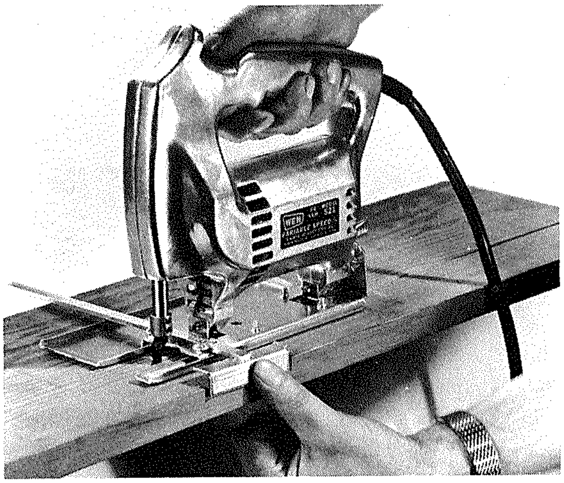
FOR PERFECTLY square cuts when sawing lumber to length, use a small try square to guide the saw's shoe.



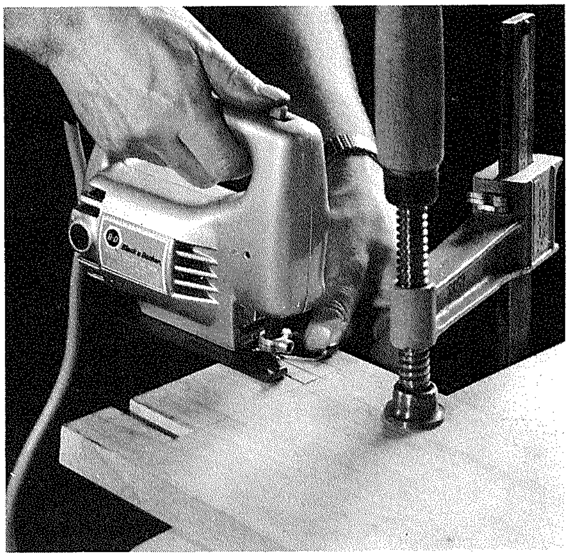
TO CUT PANEL stock with bench-saw accuracy, run the saw's shoe along a square clamped to the work.



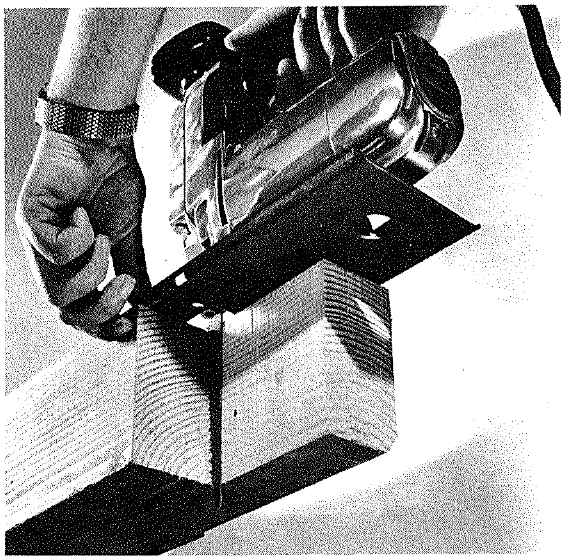
ON ALUMINUM, use a blade with teeth fine enough not to snag, but coarse enough to avoid any loading.



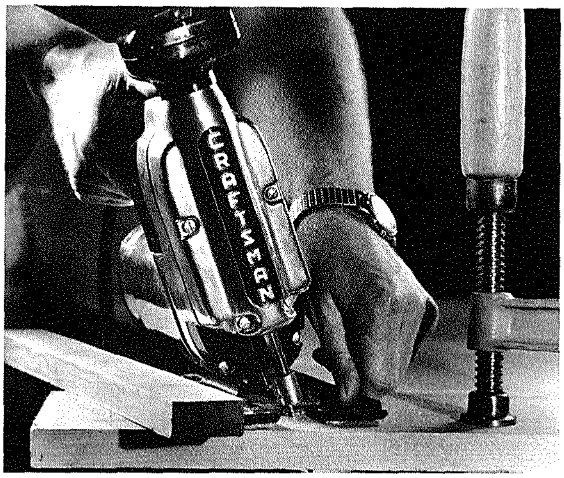
EDGE GUIDE attachment keeps saw parallel with the stock's edge, simplifies ripping narrow strips.



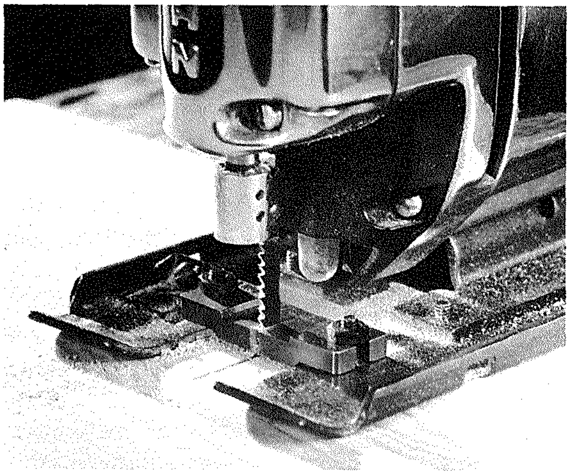
NOTCHED joints can be fitted in minutes with a sabre saw. The tool is vital to boatbuilding.



WITH A 6-in. blade, a 1-in.-stroke saw can notch 4x4s, lop tree branches, and open partitions.



TO CUT compound-angles with a tilt-base saw, tilt the base and tack a wood fence to the work.



SHOE INSERT, an attachment available for some saws, reduces splintering when you cut plywood.

rip 2-in. planks twice as fast as smaller models, and with extra-length blades they can cut off or notch 4x4s.

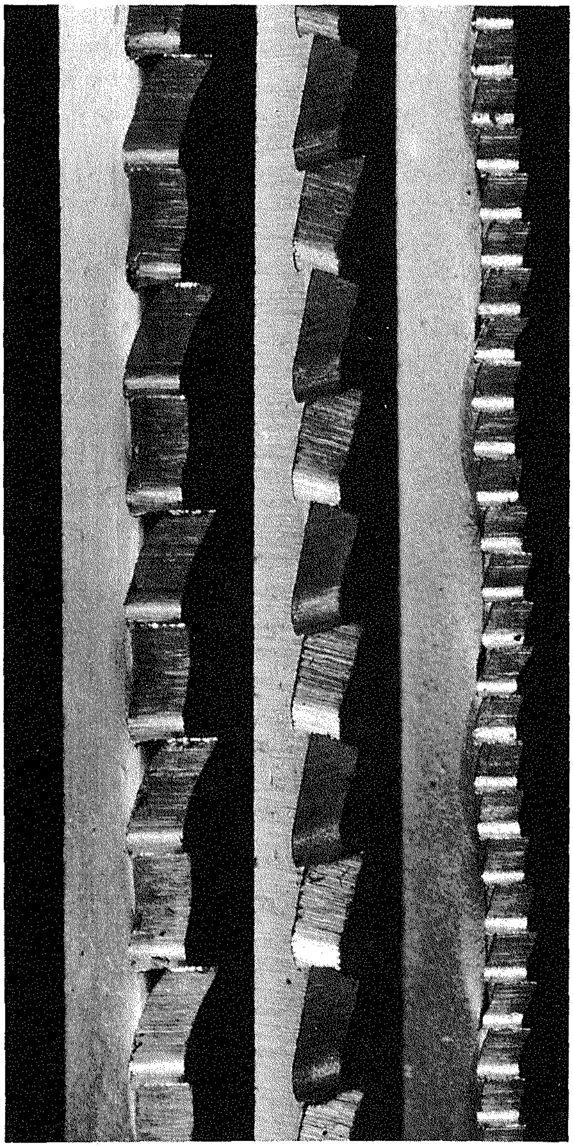
A lightweight, light-duty sabre saw is perhaps easier to handle, and if you'll use it only for light woodwork—cutting off 2x4s and sawing plywood—it's just the tool for the work.

But if you'll use your saw in construction work, a larger, faster-cutting model will be worth the extra money. A heavy-duty saw is also preferable if you'll be sawing metal. Larger models have enough power to gradually hacksaw through mild-steel plate, and because the longer stroke utilizes more of the blade's teeth, metal-cutting blades give longer service.

- **Single or multiple-speed?** A single-speed saw operating at a no-load speed of around 3000 strokes per minute is fine for light woodwork—but not much else.

Two and three-speed models, while more expensive, are more versatile. A three-speed tool generally has a medium speed of about 2500 strokes per minute and a low speed of around 2250 strokes.

THREE KINDS of blades will handle most work. Fast-cutting blade with alternate-set teeth (left) saws a wide kerf. A smoother cutting, taper-ground blade (center) cuts more slowly and leaves a narrower kerf. The metal-cutting blade (right) is wave-set for minimum snagging and a smooth cut.



saw versatility, continued

Several higher priced heavy-duty saws now have trigger-controlled continuously-variable speeds of from 0 to 3000 strokes per minute. Others have dial-type controls giving full-power speed ranges around 1300 to 3000 strokes per minute.

Slow speed is a considerable advantage. A saw chugging along smoothly at moderate speed is more pleasant to use and easier to guide than one chattering lickety-split. And slow speed makes the tool more suitable for metalwork. Even the slowest speed of some multispeed sabre saws is really too fast for heavy-duty hacksawing because even top-quality, metal-cutting blades dull rapidly when used at more than 1500 strokes per minute. Slow speed is also useful for power-filing.

- **Saw-bar action.** In most portable sabre saws the blade travels straight up and down. A mechanism in some models rocks the blade slightly as it reciprocates, giving an orbital cutting action. Orbiting, the blade bites into the work on the upstroke and clears on the downstroke. This provides better chip clearance.

In an industrial-model saw designed for fastest possible cutting, orbital action is a significant advantage. For a saw used in a home shop, it's less important. Orbital saws are more complex mechanically and higher priced, and in home shopwork the added cutting speed is hardly worth the extra cost. Besides, you can have similar fast-cutting action with a straight-line saw by using a canted blade (angled or curved slightly forward).

Smooth saw-bar action, however, is important, since a well-counterbalanced saw is much more comfortable to use than one that vibrates excessively. To check the balance of a saw you're considering, switch the tool on and feel the action.

- **Metal or plastic casing?** Some saws have die-cast aluminum casings; others have casings of injection-molded ABS plastic. A metal case makes a longer lasting tool. But any portable electric tool with a metal case should be gounded electrically to protect the operator in the event the tool should short, and this means a three-wire cable with a three-prong plug.

metal-cased saw preferable

If your shop area is properly wired with grounded receptacles, a metal-cased sabre saw is undoubtedly preferable. But if you'll be plugging into ungrounded outlets, a double-insulated plastic-cased saw is safer. Too, a plastic-cased tool is somewhat quieter.

Some manufacturers compromise, using a metal motor casing with a plastic handle—a combination used for many industrial saws. This makes the tool safe, yet satisfies anyone who still feels prejudice against plastic tools.

- **Tilt or no tilt?** Several sabre-saw models, light or heavy-duty, are available with a tilting or fixed base shoe. While a tilting shoe can be a convenience, it's a feature you'll seldom use. Sabre-sawing bevels isn't especially common.

Depending on saw design, a fixed shoe may be preferable. A nontilting shoe is more solid and lowers the saw's profile. A low-handled sabre saw is easier to guide than a high-handled one.

- **Selecting blades.** Since the blades do the cutting, it pays to buy quality ones. An inexpensive saw with a fine blade will give better performance than a more expensive saw with a cheap blade.

Many specialty blades are available for portable sabre saws, but three kinds handle most work: alternate-set blades, taper-ground blades and wave-set metal-cutting blades.

alternate-set blades for rough cuts

Alternate-set blades, with teeth swaged alternately right and left, are general-purpose blades used for rough cutting. Blades with six teeth per inch are suitable for stock more than 1 in. thick; blades with 10 teeth per inch are preferable for wood less than 1 in. thick. Alloy-steel blades stay sharp longer than carbon steel blades.

Taper-ground blades are something like hollow-ground circular saw blades. Their back edges are ground thinner than their front edges. They cut narrower kerfs than set blades and are more difficult to turn. They do make beautiful finish cuts in hardwood.

Wave-set, metal-cutting blades, though thicker, are much like hand hacksaw blades. Liberal use of cutting oil when hacksawing steel prolongs their life.

While most sabre saws use blades with standard-pattern shanks, Rockwell, Bosch and a few other makes have improved-design chucks using special blades. They grip the blade more securely, but limit your choice of blades to those supplied by the manufacturer.

In all, it's well worth shopping around before you buy a sabre saw. Look at industrial-model tools sold through industrial supply firms as well as home-shop saws sold through hardware stores. Get the best model you can afford, for your sabre saw will be one shop tool you'll use a great deal.

Wind-damaged door

My wood combination door was flipped open by the wind and split along the hinged side. New doors are expensive. Is it possible to repair it?—E. Corbell, Memphis.

If the split or splintering is clean and can be tightly fitted back into place, a sound repair is possible. Spread waterproof glue uniformly along the length of the split, then apply a few C-clamps to bring the split together tightly. Where the split extends to the bottom of the door, you will need to use bar clamps. You can reinforce the glued joint further with corrugated fasteners spaced 12 in. apart.

Brass or plating?

How do I tell for sure if metal is genuine brass or some other metal brass-plated?—Jay Holden, San Francisco.

A magnet will show if a ferrous metal, such as steel, has been brass-plated. If the metal under the plating is steel, the magnet will be strongly attracted to it. But if the metal is all brass, which is a nonferrous metal, the magnet will not be attracted. However, there are other nonferrous metals that are sometimes plated with brass, and these pieces would not affect the magnet either.

Painting fiberboard walls

I have fiberboard walls – that's what I hear they are called—on a back porch. The paint appears to be that which was applied originally, but now the walls are in need of repainting. Should I use a latex or an oil paint?—Jim Winston, Topeka, Kans.

From your description I suppose that these walls have been made with tongue-and-groove "planks," that were either prepainted or factory painted. I would prefer to use a latex paint after applying a primer of the type intended for such paint.

Crawl space ventilation

My home is on a slope with two of four 8x10-in. vents in window wells 20 in. below grade. There's a 27-in. insulated crawl space with a plastic-covered dirt floor. Do I have enough ventilation? And should the vents be open or closed in winter?—Edward D. Mattox, Lewisburg, W.Va.

If I understand your description correctly, you should have adequate vent area. The vents should ordinarily be left open during the winter months.

"Sweating" floor tiles

I recently tiled a half bath in my basement. Now the tiles have loosened and the cement is soft and oozy underneath. The top surface of the tiles seems to be damp, almost wet at times. I used asphalt tiles and was careful to spread the cement uniformly. What's wrong and what can I do now?—T.F., Ore.

Did you use the recommended waterproof adhesive, which is also resistant to the alkali in the concrete floor? If not, then you're not going to like what I'm about to suggest: Remove the tiles, clean the tiles *and* the floor and re-lay them as before, using the *proper cement recommended for application below grade.* It's a messy and rather tedious job but there are solvents available that will ease the chore somewhat. This, it seems to me, is the only sure way to correct the trouble.

Mitered joints move

In my three-year-old home the door and window trim (casing) is mitered at the upper corners. These joints open during the heating season and close in the summer. I'm going to paint the trim. Is there a way to stop this opening and closing?—Milton Greer, Aiken, S.C.

A permanent remedy is doubly difficult as this is caused by slight shrinkage and expansion of the trim wood, and perhaps of the frames. You might pry off one trim member, coat the joining miter surfaces with white glue or epoxy adhesive and then renail the member, without nails in the miters, as these could crack the casing next heating season. Any ordinary crack filler would probably be squeezed out and form a bead or ridge at the joints. Trim pieces must be removed with care to prevent damage, and the glued joints sanded after nailing and refinished to match.

Stubborn screens

Screens in my combination windows either stick or raise and lower with great difficulty. How can I make them easier to operate?—Mrs. Jack Thomas, Kansas City, Mo.

There is a silicone lubricant you can get in aerosol containers from your paint or hardware dealer that generally eases these parts and makes them slide with little effort—provided the channels have not been kinked, bent or otherwise damaged. It's a good idea to clean the channels first with a mild soapy solution, using a brush to remove the dirt and grime that collect in them in time. Then spray each channel and slide the screens up and down several times to distribute the lubricant uniformly.

by W. Clyde Lammey

A ‘table saw’ from your sabre saw

By **WALTER E. BURTON**

NUMEROUS SMALL sawing jobs often create handling problems that are as large as those you face when you’re single-handedly maneuvering a 4x8 sheet of ¾-inch particleboard. From time to time, many woodworkers are challenged with the task of sabre-saw cutting a piece of board that’s just too small to be clamped or to be held securely by hand. And for such small jobs as cutting thin strips from veneers and plywoods less than ½-inch thick a table saw is actually too big. One way to overcome such irritating challenges is with the use of the shop-built sabre-saw table shown below.

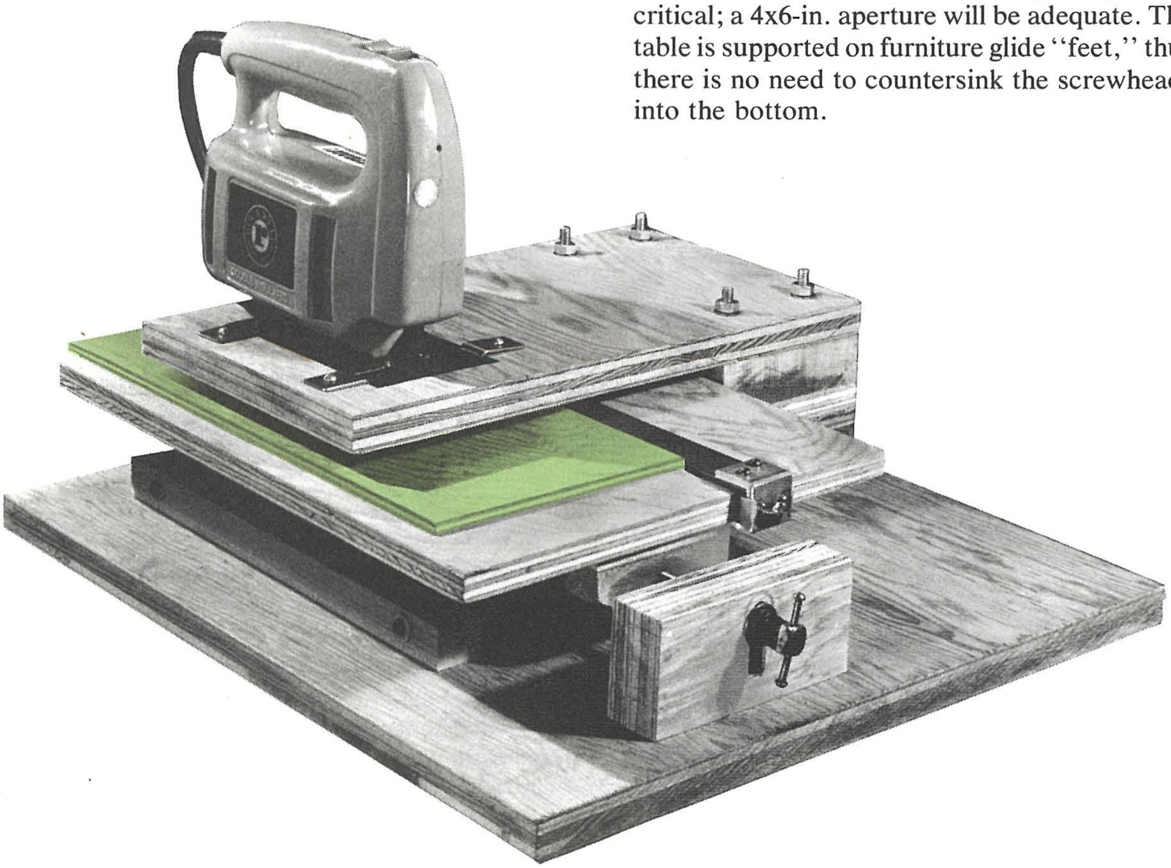
While this fixture was designed to accommodate a Model 68 Rockwell tool, you can alter the dimensions to suit any make and model of sabre saw (also known as a portable jigsaw).

Because a portable jigsaw cuts on its upstroke, the material being sawed must be held firmly against the saw platform. This is accomplished by a screw (bolt) that operates a parallel-bar arrangement, and through “cushioning” by a coil spring.

This ingenious table is built mostly of plywood. You’ll find it easy to assemble if you follow the construction details shown.

First, attach the parallel-bar unit to the base panel with No. 8 fh screws running downward. Notice that the screwheads are flush with the bar surface. Secure the saw-platform supporting block with four ¼ x 5-in. carriage bolts (you may find that three bolts will be adequate). Wood screws installed from the bottom anchor the block in which the table-control screw operates.

The size of the saw cleanout opening is not critical; a 4x6-in. aperture will be adequate. The table is supported on furniture glide “feet,” thus there is no need to countersink the screwheads into the bottom.



SEE ALSO

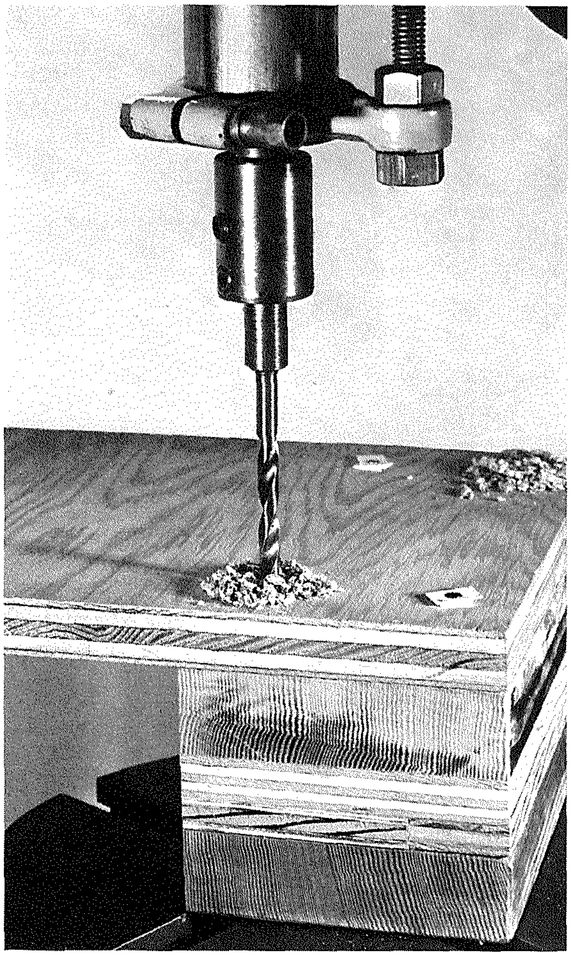
Bench saws . . . Motors, shop . . .
Power-tool stands . . . Table saws

Glue together several 3⅞ x 7-in. pieces to form a platform supporting block that is about $3^1/_{16}$ in. high. You'll find that a little testing will be in order to determine the height preferable for you. (When the table is at maximum height, it can be no closer than the thickness of the work-guide bar: on the stand shown, ⅛ in.)

Attach the four 10-in.-long bars to two pivot blocks with four wood screws. It's important to space these screws uniformly to assure accurate movement of the parallel bars. Fasten the work-support table to the parallel-bar unit with screws that run upward through the top bars, but not through the tabletop. The saw slot should be positioned after the stand has been assembled with the sabre saw in place.

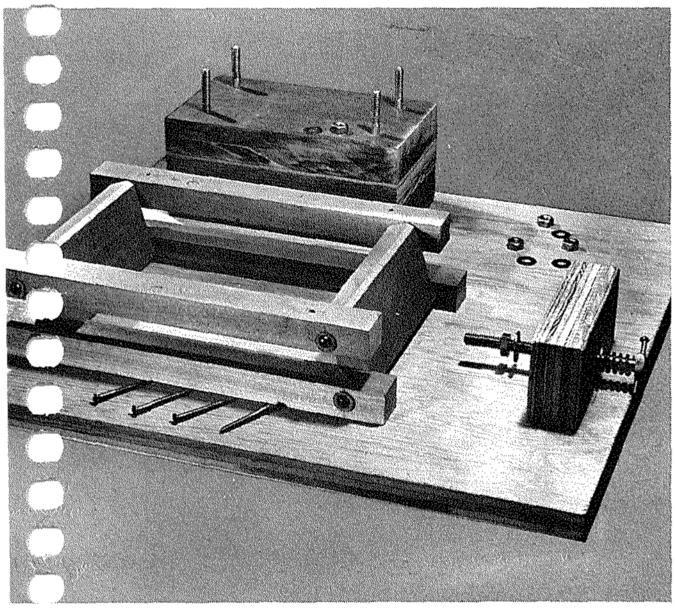
The saw rests in a rectangular opening and is supported by a thin metal plate. Cut the plate slightly longer than the width of the plywood platform so that the front and rear edges can be bent slightly upward. Then you can anchor the saw in its recess with four L-shape clips secured with screws. The shorter ends of the clips will press downward on top of the saw base when the screws are tightened.

The table-height control was made from a $^5/_{16}$-18 x 4-in. bolt, with a rod crosswise through the head for easier turning without a wrench. The coil spring between the head and the block enables the table to "give" slightly and serves as

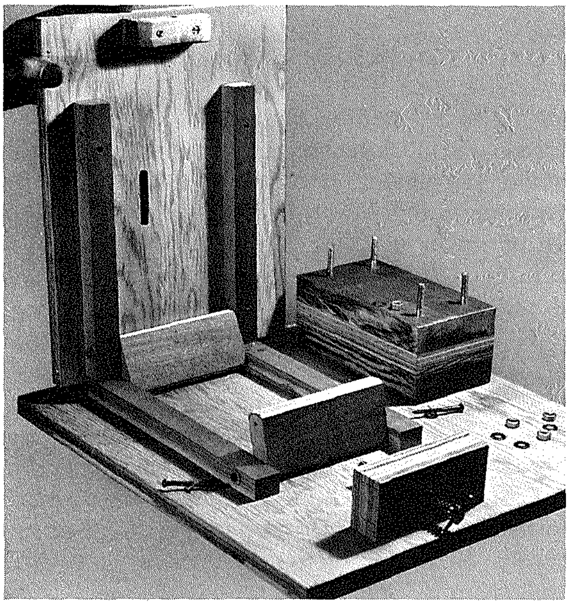


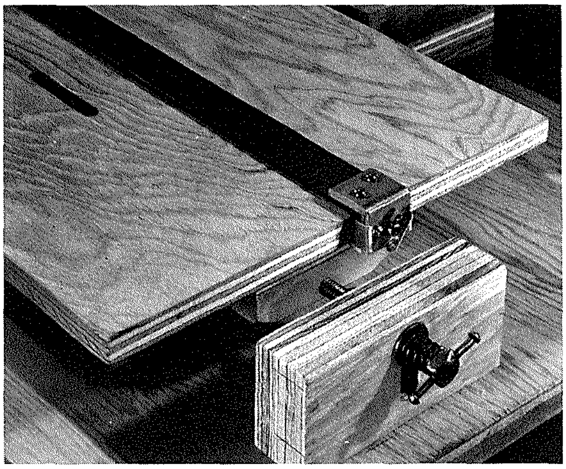
HOLES ARE BORED simultaneously through the saw platform and through the supporting block. The platform is secured temporarily with two nails.

COMPONENT PARTS, parallel-bar unit, saw-platform-supporting block and adjusting-screw block are all firmly attached to the baseboard of ¾-in. plywood.

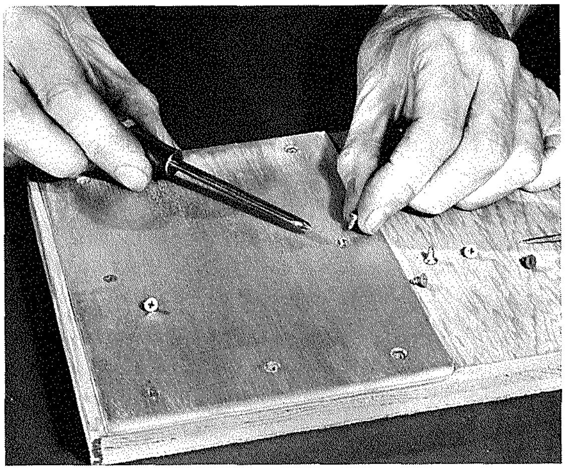


BY REMOVING two pivot screws from the parallel-bar unit, the upper bars can be easily swung up for installation or removal of the table.

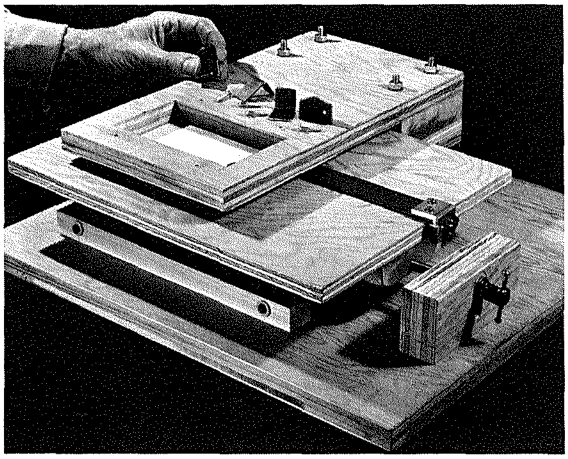




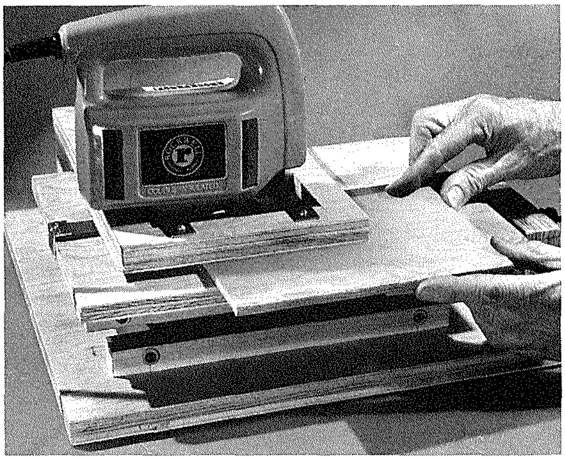
WORK GUIDE BAR is adjustable across the table and is locked in position with a special wingbolt which presses against front edge of the table when tightened.



SHEET-ALUMINUM plate that supports the sabre saw is fastened to the bottom of the saw platform with eight tiny fh screws turned into countersunk holes.



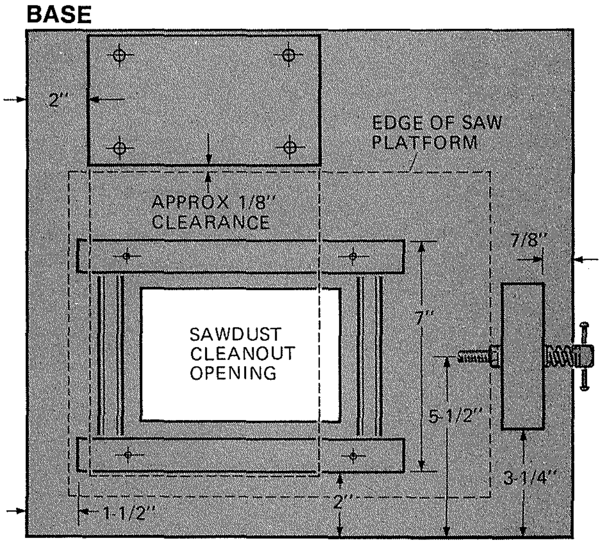
SABRE-SAW BASE is anchored to the platform with four L-shaped metal clips spaced along the sides of the rectangular recess. Clips are attached with rh screws.



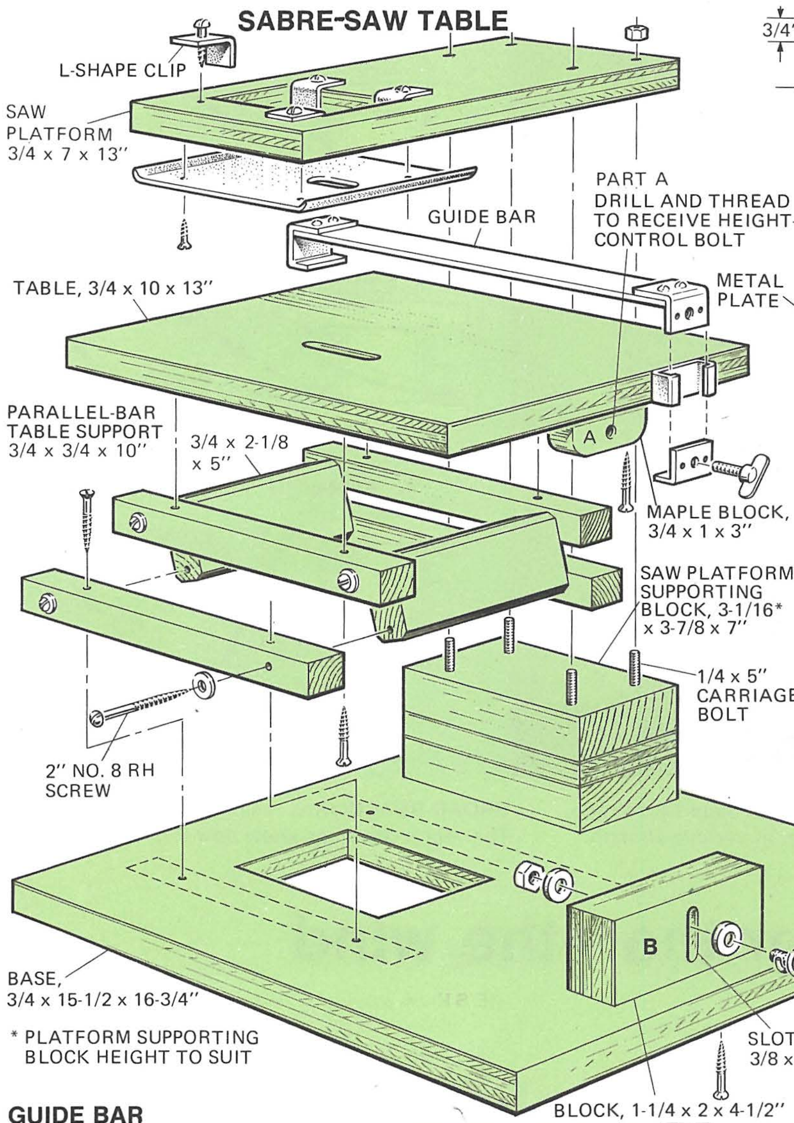
HERE'S HOW work is fed into the saw by passing it under saw-supporting platform and along the guide bar. Saw handles work to ½ in. thick and 6 in. wide.

an aid in preventing binding. A dab of oil or grease will lubricate the bolt in the threaded hole of the maple block. By turning the bolt in or out, you can raise or lower the table. The bolt moves up or down with the table and automatically adjusts itself in the slot of the block that's fixed to the base.

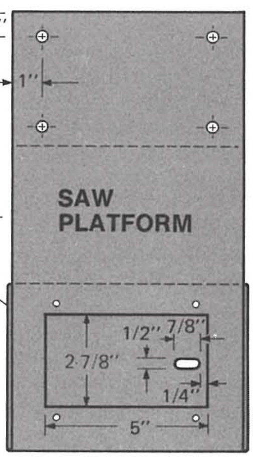
To use the stand, push material past the saw blade much the same as on a conventional table saw. Overhang of the saw platform and the table helps to shield the blade, while pusher sticks are used to move the work past the blade and out the rear of the opening between table and saw platform. The work-guide bar must be clamped securely enough not to yield under pressure applied to workpiece.

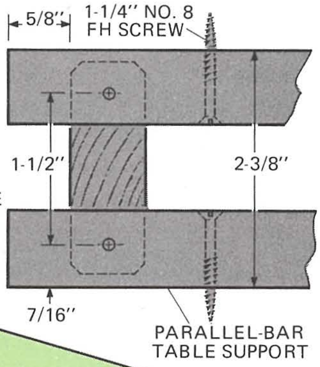


SABRE-SAW TABLE

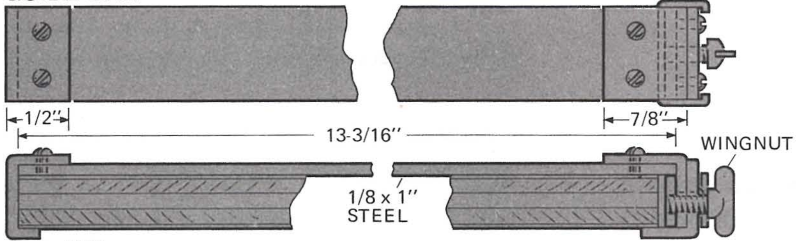

L-SHAPE CLIP
SAW PLATFORM 3/4 x 7 x 13"
GUIDE BAR
PART A DRILL AND THREAD TO RECEIVE HEIGHT-CONTROL BOLT
TABLE, 3/4 x 10 x 13"
METAL PLATE
PARALLEL-BAR TABLE SUPPORT 3/4 x 3/4 x 10"
3/4 x 2-1/8 x 5"
A
MAPLE BLOCK, 3/4 x 1 x 3"
SAW PLATFORM SUPPORTING BLOCK, 3-1/16* x 3-7/8 x 7"
1/4 x 5" CARRIAGE BOLT
2" NO. 8 RH SCREW
B
COMPRESSION SPRING
5/16"-18 BOLT
SLOT, ABOUT 3/8 x 1-1/2"
BASE, 3/4 x 15-1/2 x 16-3/4"
BLOCK, 1-1/4 x 2 x 4-1/2"

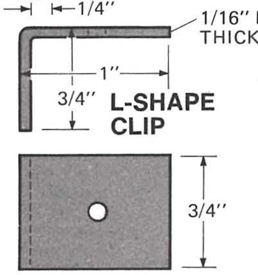
* PLATFORM SUPPORTING BLOCK HEIGHT TO SUIT

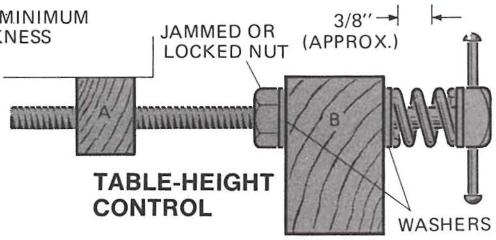




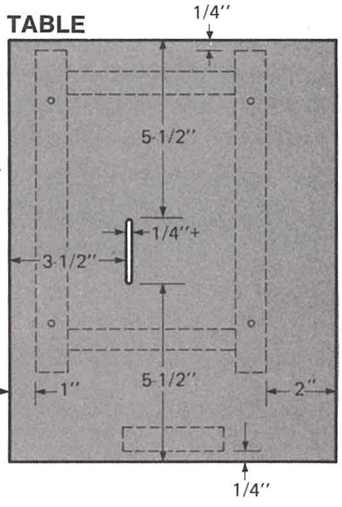
GUIDE BAR

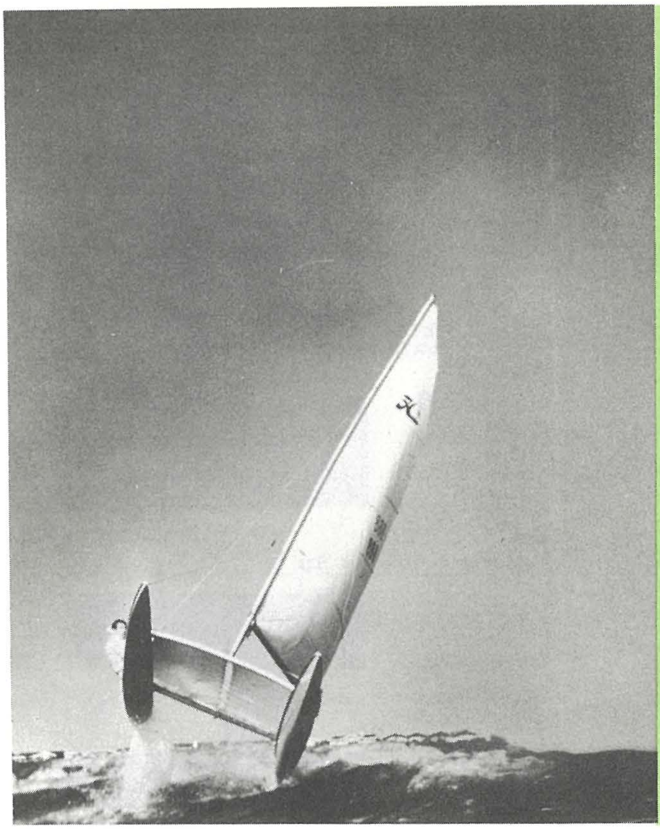




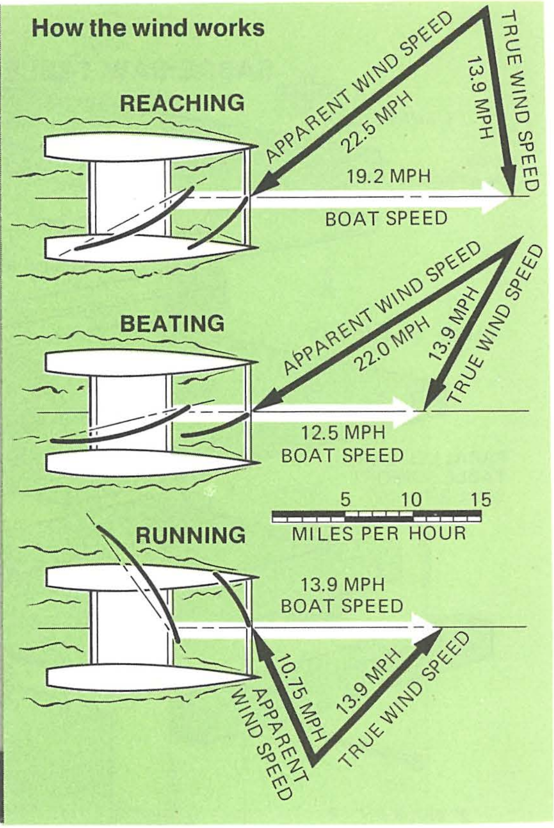


TABLE





HOBIE CAT, from Coast Catamaran, San Juan Capistrano, CA, has been officially clocked at an incredible 26 mph.



BROAD REACH gives racing cats the highest speed. The vector drawings show how it is done with this craft.

Sailing faster than the wind

By N. M. IYE

Incredible as it may seem, efficient sails and multihulls make some boats swifter than the powerful winds that push them through the water or across the ice

SEE ALSO

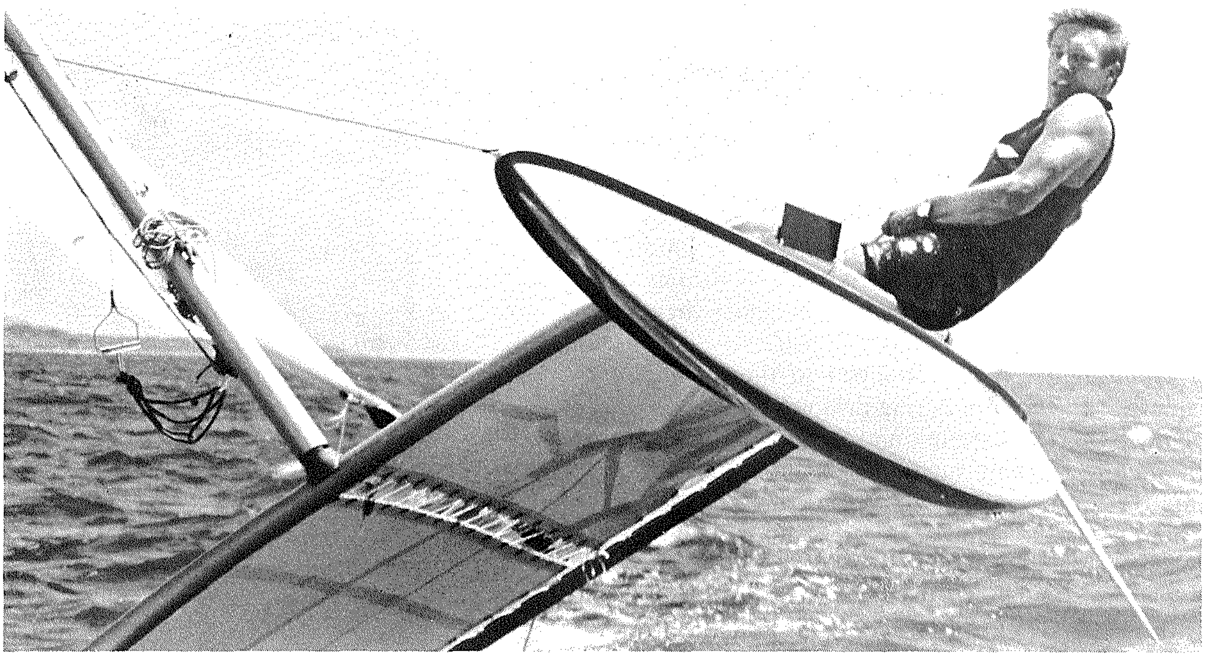
Boat testing . . . Boating . . . Boats . . . Canoes . . . Kayaks . . . Pontoon boats

SAILING FASTER than the wind seems impossible—like getting something for nothing.

Yet thousands of boats can do this, though most skippers do not fully understand why or how. Iceboats can sail about four times the speed of the wind that drives them. Racing catamarans can do about 1.2 times the speed of the wind, and future multihull designs may get up to twice the speed of the wind. Some planing monohulls can go faster than the wind. But keel boats can never equal the speed of the wind, let alone go faster.

There is a general misunderstanding that sailboats move only because the moving air pushes them downwind. It seems illogical that an object could move faster than the force moving it.

That was true in the days of old square-riggers and before man learned to sail into the wind. But now the answer involves the difference between the true velocity and the apparent wind velocity.



HIKING OUT ON one hull of a swift *Hobie Cat* in a brisk wind is the designer of the boat, Hobie Alter.

True wind seems obvious enough. It is simply the speed of air passing a fixed point. It may shift around a bit, but it usually has a general direction or heading.

Apparent wind is something else. Suppose you are walking or running. On a calm day you will feel the wind directly in front of you. But suppose there is a 10-mile wind blowing from your right. As you run forward at about 5 mph, you will feel the apparent wind shift to the right front quarter of your face. You know the wind is still coming from the right, but adding in your forward speed makes the apparent wind shift up ahead—so it comes in from a forward, as well as side, angle. If you increase your forward speed and the side wind stays the same, the apparent wind shifts even farther ahead.

This is what happens with a boat. With an iceboat the runners traveling over a hard, slick surface meet little resistance going forward. With a sailboat the hull must displace water that is heavy and also meet friction resistance caused by its wetted surface. Keeping the boat light makes it possible for a boat to move faster. Keelboats are weighty, so they displace equally large weights of water and put up substantial frontal area resistance as well. The combination makes it impossible to outspeed the wind.

But with lightweight, highly-streamlined catamarans the story is different. Since the hulls skim the surface, the faster they go the faster the apparent wind becomes. Even when going downwind, iceboats and racing catamarans tack from side to side to get the most speed from the apparent wind. The result: Even though the total distance from side to side is much greater than the straight-line distance downwind, they can cover the straight-line distance in less time than if they merely drifted.

As diagrams on page 2636 indicate, the highest apparent winds are achieved on a broad reach, and as the speed builds up and the apparent wind moves forward, the fastest heading of the boat moves away from the true wind. At its highest speed the boat is actually going away from the true wind but still into the apparent wind. All the time the angle of the boat to the apparent wind stays almost the same, no matter what the course is in relation to the true wind. The angle of an iceboat may be 10° to 20° off the apparent wind.

More exciting are relative speeds. For an iceboat, speeds up to 50 or 60 mph are possible with winds of only 15 mph. On a conventional sailboat, speeds to 6 mph are possible with 10-mph winds. High-performance catamarans have reached 35-mph speeds with 25-mph winds.

This last figure points up the drag of water friction that holds a sailboat back. Possibly when hydrofoils and more advanced sails are developed, the relative speeds of waterborne boats will approach the almost dragless efficiency of iceboats.

Salt-and-pepper cylinder

By ELMA WALTNER

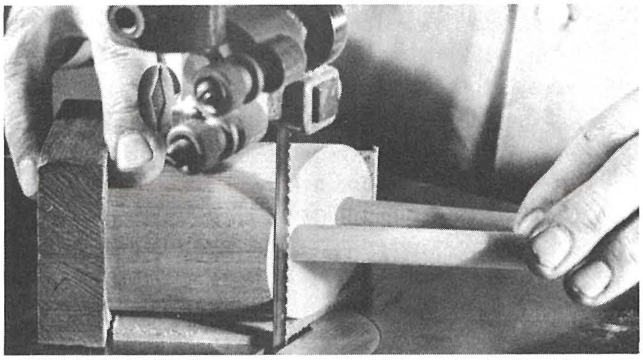
SOMETHING DIFFERENT in the way of salt-and-pepper shakers always makes a good gift. This novel hardwood set is made by turning a cylinder, drilling the cavities, plugging them and then sawing the cylinder in half.

The cylinder is left attached to the turning square at the bottom during drilling. Locate the centers for the cavities and drill ¾-in. holes through the turning square extension. Go ¼ in. into the bottom of the cylinder for each cavity. Then, using the same centers, drill ½-in. holes through the entire depth of the cylinder.

The upper ends of the cavities are plugged with ½-in. dowel pegs which contrast with the dark hardwood. Drill the shaker holes in these.

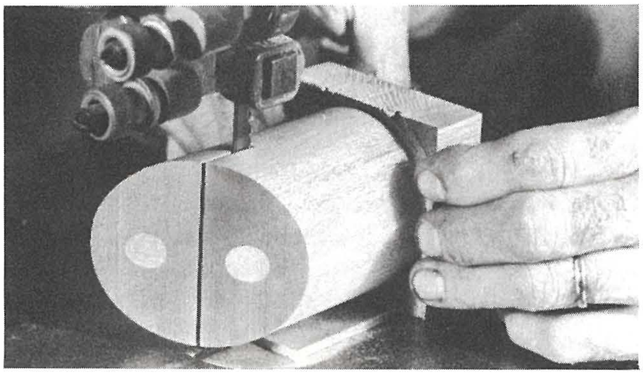
SEE ALSO

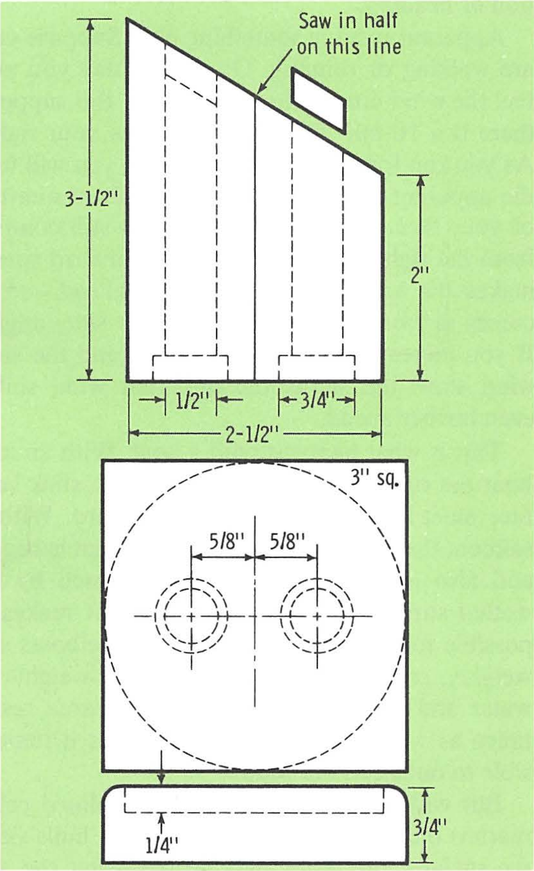
Dowels . . . Gifts, Christmas . . .
Kitchen accessories . . . Wood-lathe techniques



AFTER DRILLING the cavities saw off the cylinder top. Insert the dowels and saw them off to match slant of the top.

SPLIT THE CYLINDER, sawing only down to the block. Then separate the cylinder from the turning block.





A sandbox and play table

By VICTOR H. LAMOY

■ THIS CUTE SANDBOX and table will keep youngsters happy while outdoors, yet it can be disassembled easily.

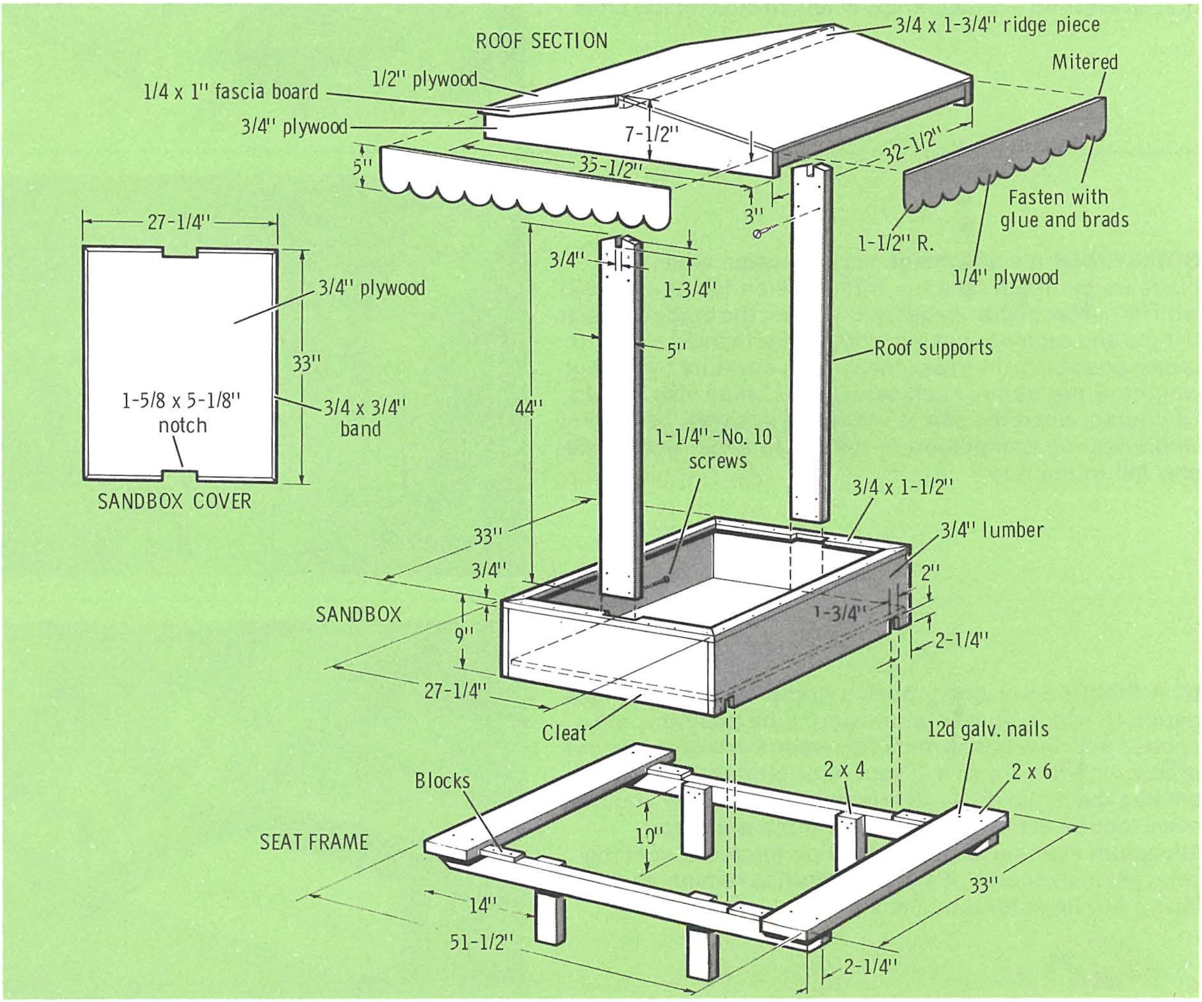
The unit is composed of a seat frame, a sandbox with tabletop cover, a roof unit and the roof supports. You can use pine lumber or ¾-in. exterior plywood.

The bottom of the box is raised 2 in. to clear the notches that allow the box to fit over the side rails of the seat frame. Don't try to do without the spacer blocks since they keep the box from sliding.

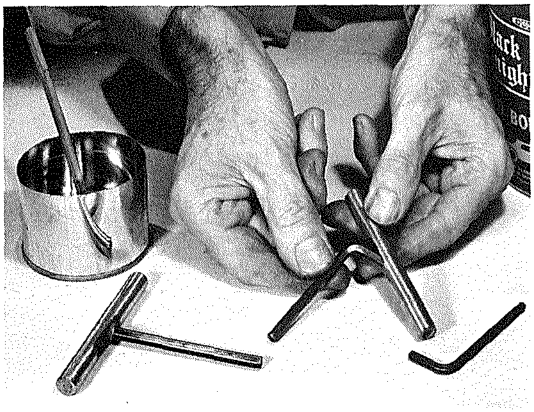
Painting the unit with bright colors makes it eye-catching. Use two coats of weather-proof enamel for a lasting finish.

SEE ALSO

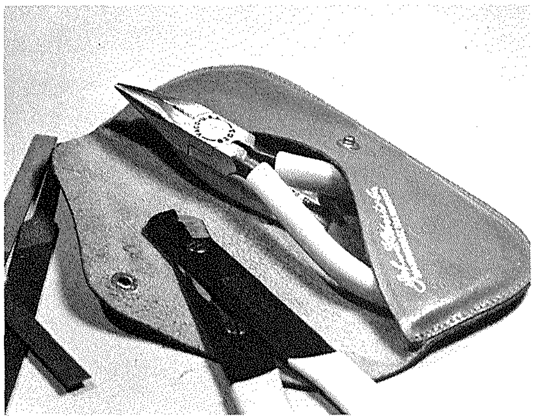
Playgrounds . . . Playhouses . . . Swings . . . Toys



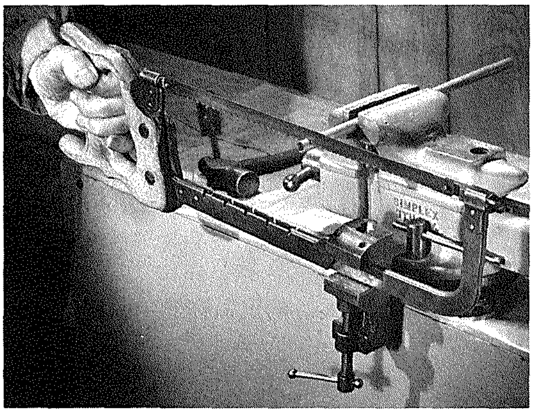
L-SHAPED SOCKET WRENCHES are often easier to use when fitted with handles which convert them to T-shape. One way to do this is to form a short slot in one wall of a 3-in. length of ⅛-in. pipe to accept the short leg of the wrench. With the wrench in place, pack the pipe with autobody filler or epoxy putty to anchor it. A series of overlapping holes will form a suitable slot.



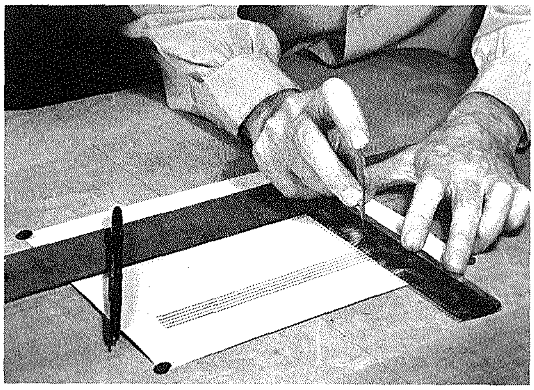
ONE OF THE NEATEST pouches for storing tiny tools and delicate shop instruments is a discarded eyeglasses case and there's hardly a home that doesn't have one going to waste in a drawer. Whether it's a pouch or buttoned-flap type, you'll find it just the ticket to keep track of small files, cutting pliers, shop tweezers, drift pins and countless other small tools which have a way of "wandering off." Tuck it in your toolbox or workbench drawer and you'll always know where to look for the tools.

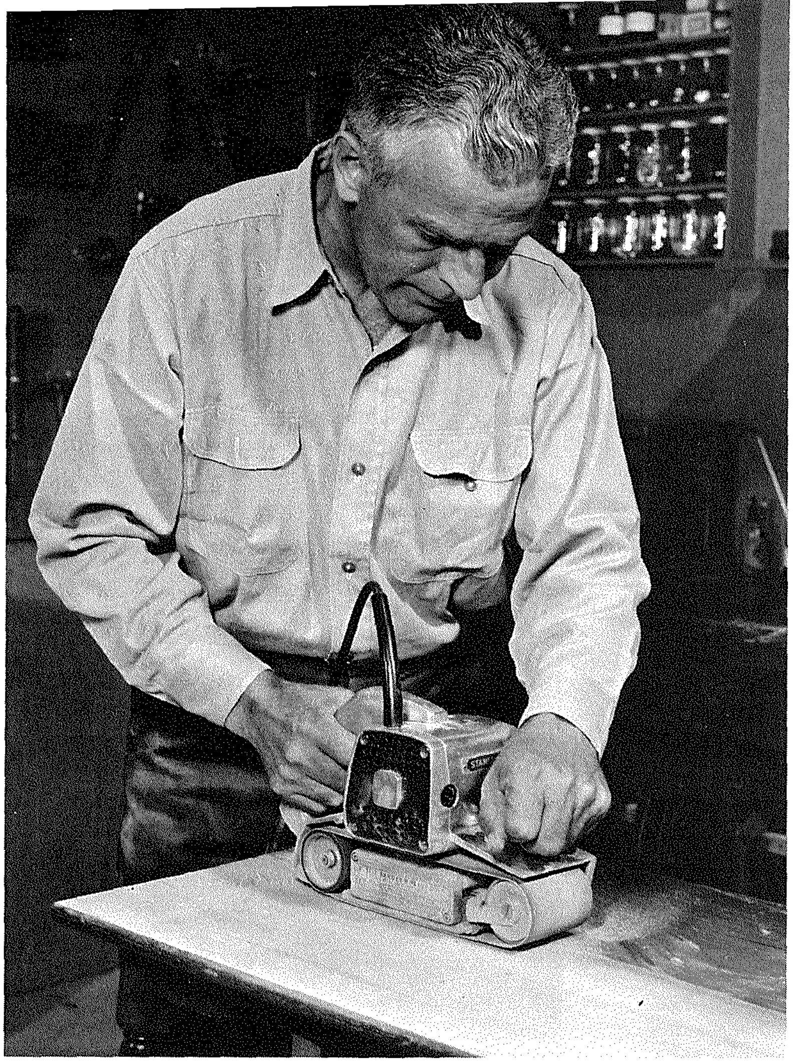


SOMETIMES it's advantageous to reverse a hacksaw blade so the teeth face the frame. When the saw is held with its center of gravity below the work, the blade is easier to hold and seems to cut more smoothly. In this position it is also possible to increase the cutting pressure by adding weight to the frame, such as with the small vise shown. Of course, when the saw is weighted this way, be careful when nearing completion of the cut to avoid letting the saw fall to the floor.



IN A PINCH an ordinary pocket comb can be used as a gauge to space lines in a drawing. Line positions are spotted with fine pencil marks between the teeth and then drawn with the aid of a T-square or straightedge. By placing the comb diagonally instead of vertically you can even reduce the minimum single-tooth spacing. Maximum spacing is determined by the tooth spacing selected in the comb. It's a good stunt to remember when laying out lines for a music staff.





Thorough sanding is one of the hallmarks of the master finishing craftsman. It's that all-important initial step

Sanding from start to finish

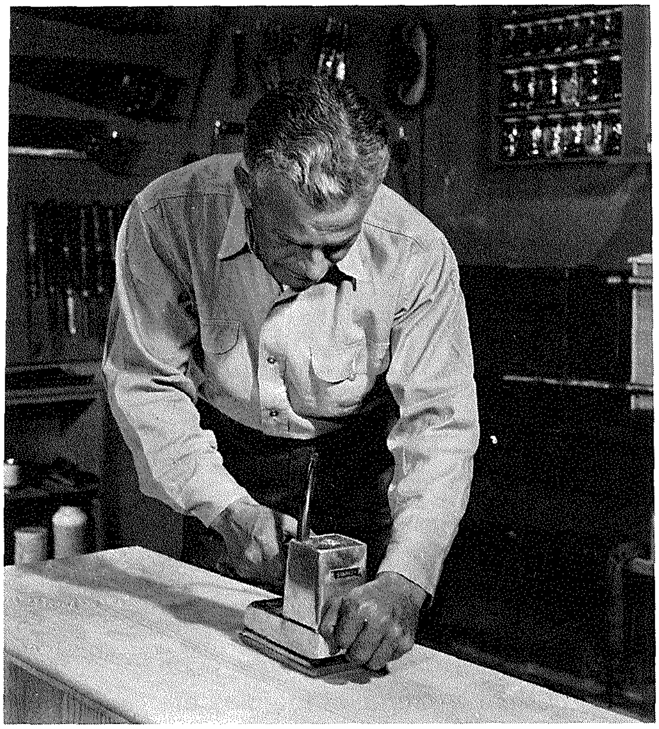
By W. CLYDE LAMMEY

▨ GOOD FINISHING begins with good sanding. On new work sanding brings out the best in the wood. On old work which has been previously finished sanding should do two things: preserve the aged color of the wood and smooth the surface to take a new finish. Working from new-rough or old-rough is a repeat-step procedure, using sandpaper from coarse to fine through several successive steps. This applies to both hand and power sanding. In power-sanding new work you may produce an acceptable surface in three successive steps. In hand sanding it may take as many as five successive steps, using five grades of sandpaper, to end up with a surface of equal quality. Each time over must remove the "scratch" marks of the step preceding, as otherwise these marks, will show under any finish.

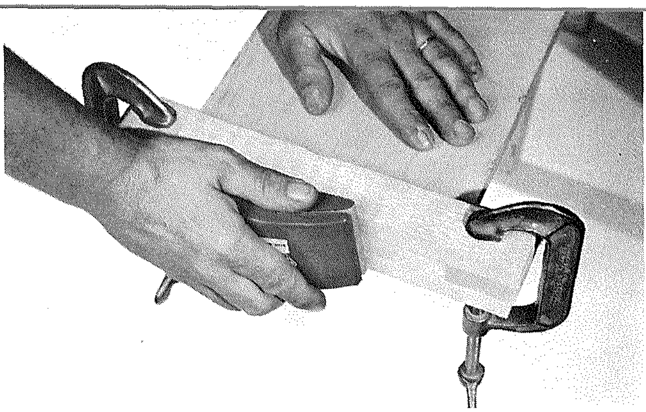
On old work preservation of the color, or patina, of fine woods usually is desirable. Take off the old finish, either transparent or opaque, with a wash-off type remover. Then sand lightly with a medium to fine grade paper and note results closely as you go. Don't use a hand scraper or power sander to remove the finish on old work when you wish to preserve the aged color. Finish with the finest grade of paper, normally 8-0 grade.

The best test you have of smoothness is simply

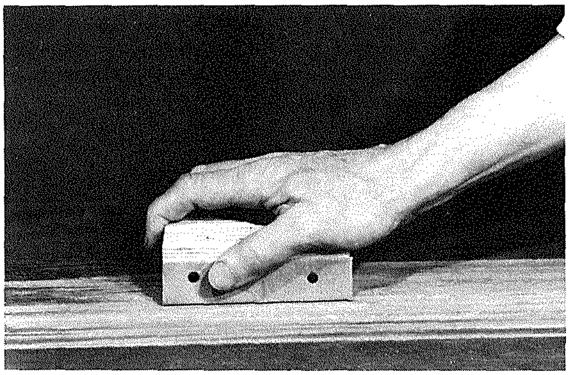
SEE ALSO
Abrasives . . . Belt sanders . . . Disc sanders . . . Finishes, wood . . . Floors . . . Pad sanders . . . Scrapers . . . Staining, wood . . . Wood finishes



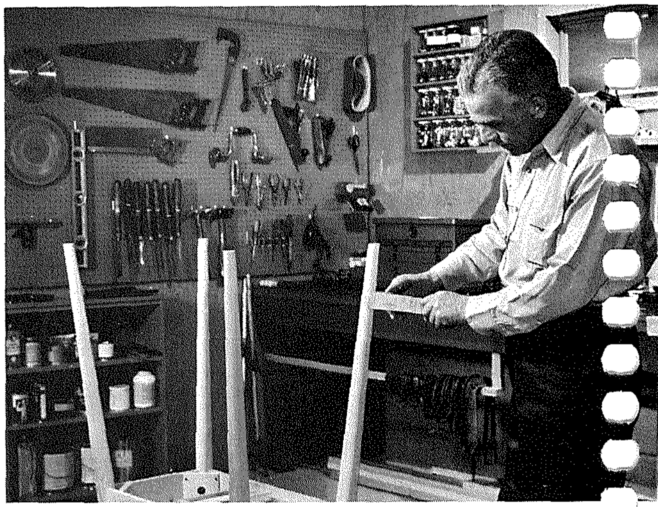
PAD SANDERS, orbital and straightline types, are used mainly for the finish steps with the finer grades of sandpaper.



TO SAND end grain by hand, clamp waste strips to work as pictured. This not only keeps end square but prevents rounding edges. Or, alternatively, use an unpadded block.



UNPADDED sanding block usually saves time and work on rough surfaces. It cuts down high spots, sands out hollows and leaves a true surface.



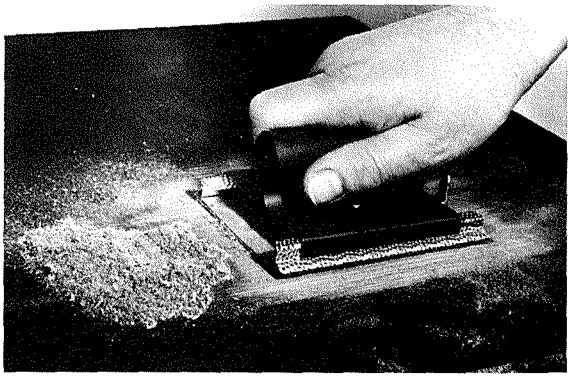
"SHOESHINE" sanding is usually best for rounding corners and sanding turnings. Method maintains desired radius and leaves smooth surface.

to draw your forefinger lightly over the sanded surface diagonally or at right angles to the direction of sanding. Thus you can detect any minor depressions, or even slight roughness. Give these places, if any, a little more attention. But be careful not to cut through that old color acquired only by the aging of the wood.

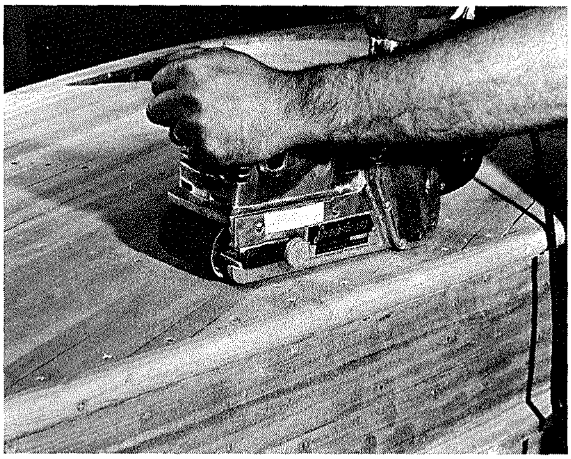
New work can be handled a little more vigorously. If you are hand-sanding and you discover any slight ups and downs on the surface, make a special sanding block from a 5-in. length of 2 x 4. Cut the ends at an angle of 5 degrees or so, cut a strip of sandpaper to the exact width of the block and to such length that the ends will fold up on the ends of the block where each can be attached with tacks. Don't pad with felt.

Purpose of such a block is to cut down the high spots, ridges and the like and level the surface the first time over. Use a uniform pressure, overlap each stroke about one fourth the width and be especially careful not to round the edges of the workpiece. Don't allow the block to overrun the edges more than about one-fourth its length or width. If there are knots in the surface, to be retained as a decorative feature of the grain, remember these usually are of a different texture, harder than the surrounding wood, causing the abrasive to cut somewhat slower. Such areas usually call for a few extra strokes in each sanding step to hold them flush. Keep a close watch when sanding certain softwoods having a coarse, flat grain. There may be especially soft areas which tend to cut down faster, producing a surface of low ridges and shallow hollows. Changing sanding strokes to a slight angle with the grain usually disposes of this problem. Keep a close check on progress with the finger-tip test.

Should the project you are working on be of



SOMETHING NEW in "sandpapering." Perforated metal forms edges that cut in all directions. Sheet is self-cleaning, removes stock very fast.



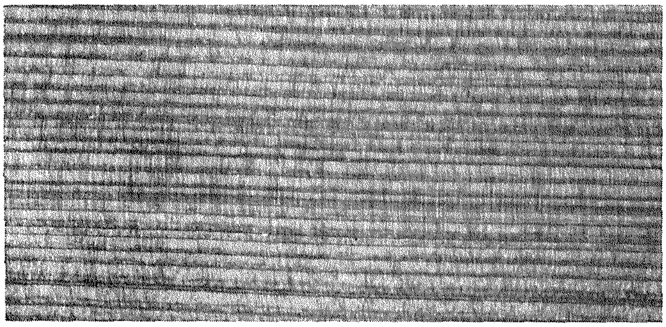
FOR BOAT-HULL sanding there's nothing quite like a portable belt sander of husky size with a belt at least 3 in. wide. It saves hours of labor.

veneer construction, either plywood or solid-core type, either old or new, be especially careful not to over-run the edges and cut down to the core stock. On new work the veneers used are likely to be quite thin, usually only about 1/28 in., and may have already been machine-sanded, so you haven't much of the veneer left for the finishing steps. On older work the veneers are usually thicker, but as a rule they've been sanded pretty thoroughly when prepared for finishing.

One disadvantage of the unpadded block is its tendency to score the work more deeply than will a padded block and also it may tilt and slightly ridge the work along the length of the strokes if you don't keep close tab on the uniformity of the pressure you are applying. But it does level the work the first time over, cuts down the more resistant areas, such as knots and vertical grain, and in the end it's a timesaver. After using an unpadded block the first time over most craftsmen go to the padded block (the bottom of the block padded with felt or other soft, flexible material) or they use a flexible rubber block such as supplied by manufacturers of sand-

USE A COARSE grade of sandpaper to bare wood after removing old finish, except on old work where you want to preserve age color, or patina. Use uniform pressure and don't allow block to tilt.

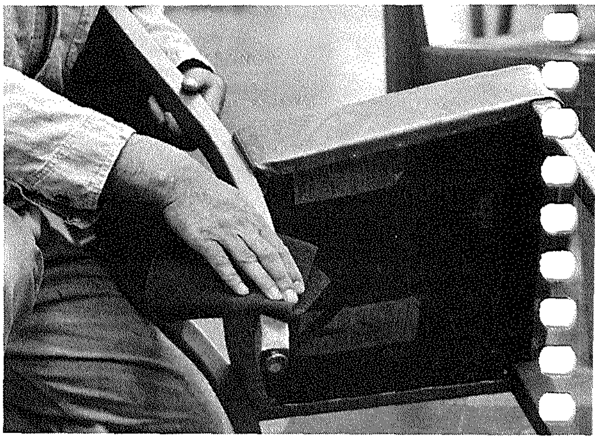
WITH FEW EXCEPTIONS, do your sanding with the grain, even though latter is at angle with workpiece.



ON OPEN-GRAINED woods such as oak, sanding at a slight angle with grain will prevent enlarging pores.

HAND SANDING, medium to fine grade, is usually done with a felt-padded block unless surface is rough or ridged. Strokes should follow grain and overlap slightly as sanding progresses.

FLEXIBLE rubber sanding block is often best for sanding surfaces originally in good condition. Care must be taken to apply uniform pressure throughout the stroke to prevent block from tilting.



ON SQUARE PARTS with rounded corners a nylon abrasive pad or fine steel wool often gives that final finishing touch.

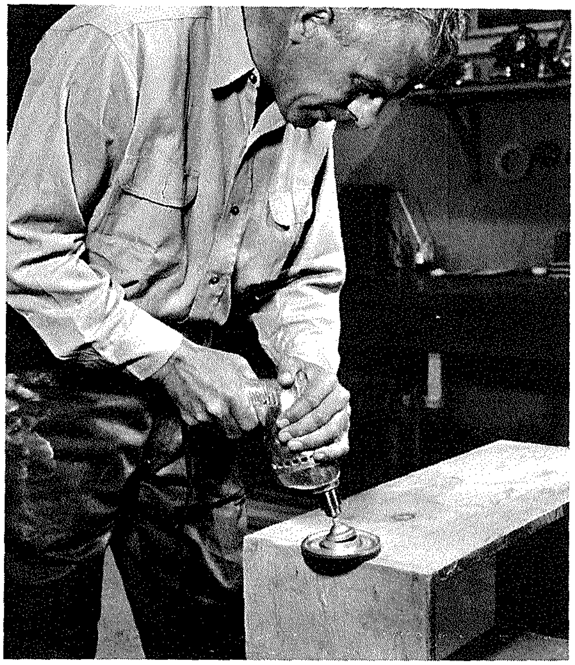
paper. Some even prefer to wrap the sandpaper around a piece of thick, hard felt for the final finish sanding. But in using flexible blocks of any type one should keep in mind that they have a tendency to round the edges and corners of any workpiece which is narrower than the block. For such work, also sanding end grain, a small unpadded block is generally best, especially if the finished job calls for sharp, straight corners with no waves or wobbles.

As a rule blocks don't work well on any type of curved surface that must be hand-sanded. Some types of straight moldings can be sanded quite accurately with flexible blocks but on moldings having irregular or curved shapes such as those on scalloped edges, one generally finds it best to cut sandpaper into small squares, fold once over and use the thumb or forefinger as the "block." Such a simple method is quite effective and much faster than one might suppose. Wear a glove or finger cot if there's much of this kind of thing to do.

The "shoeshine" method of sanding usually works best on turnings, either in the lathe immediately after turning to finish size or with the workpiece held in a vise, or on turnings already assembled, as in old pieces or unfinished furniture. Just tear or cut strips of cloth-backed abrasive from ½ to 1 in. wide, pass the strip around the work and pull on the ends in a back-and-forth stroke. When sanding in this fashion in the lathe operate the machine at a slower speed and keep the abrasive strip moving back and forth and simultaneously along the work to prevent undue heating and discoloration of the wood. As a rule you use only the medium to fine grades of abrasives in shoeshine sanding, but you use descending grades from medium to fine to eliminate scratches as you go.

Only the bulb and vase shapes and the concavities of turnings should be sanded by the shoeshine method. Don't pass the strip over narrow beads as it tends to flatten them; use instead a fine V-file or 3-cornered file, touching it lightly to the work in a back-and-forth stroke and rolling it simultaneously to retain the curvature of the bead. In many cases a strip of sandpaper wrapped around a dowel of small diameter

FOR HAND-SANDING curves of short radius, sandpaper folded several times is quite effective. Flexibility of folded "pad" allows it to follow contour of surface without digging in or scoring too deeply.



DISC SANDER of swiveling type makes short work of truing a butt joint such as that pictured. Disc cuts very fast and leaves a smooth, swirl-free surface. Use only light, uniform pressure.

is handy for getting into flutes, round-bottom cuts, also on straight moldings where short-radius shapes are involved. Spread glue on the dowel and wrap the sandpaper strip diagonally with the meeting edges of the strip butted, not overlapped.

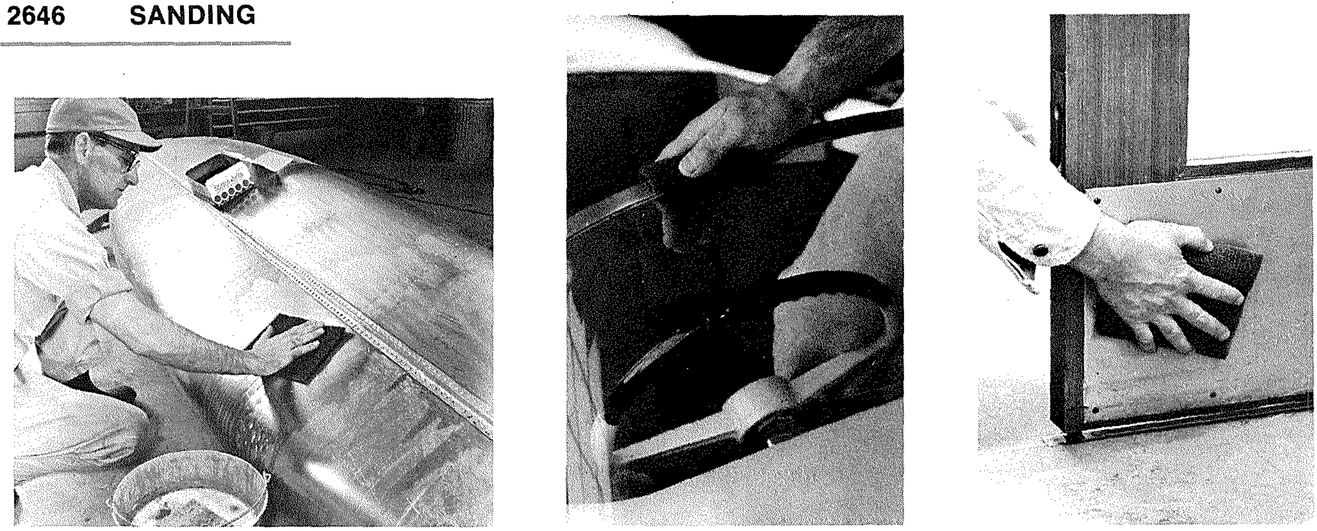
how to clean sandpaper

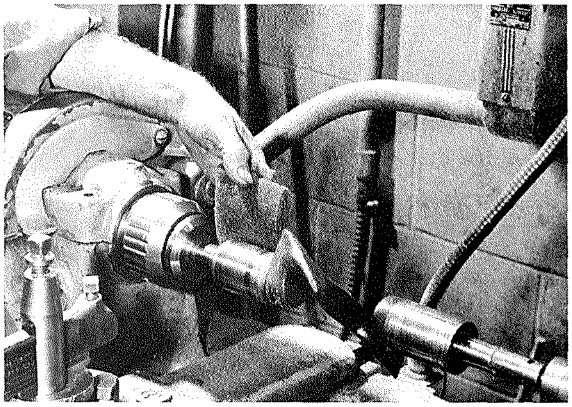
Sometimes there's trouble with the finer grades of paper clogging or glazing, especially on woods of resinous content, or on "oily" woods such as teak. Usually you can clean the abrading surface effectively with a brush having metal bristles; a brush of the type used for cleaning suede shoes is just the thing. When sanding old work preparatory to refinishing, residues of old fillers may tend to glaze the sandpaper and resist cleaning with the brush. When this problem develops just spill a little turpentine onto the work surface. This will usually cut the glaze and "resharpen" the abrasive. The turps will evaporate quickly and won't discolor the wood, but one should keep in mind that turpentine is rather highly flammable, that there is always some hazard in its use. Move the job outdoors when possible or have your home fire extinguisher handy. And don't smoke.

Once the initial rough sanding has been finished go to a finer grade of sandpaper, a grade that will remove the scratch marks of the first, and then continue the step-by-step procedure, going to a finer grade of abrasive each time, until the finger test turns up a glass-smoothness over the entire surface. Many craftsmen dampen the sanded surface after initial sandings from coarse to medium grades of sandpaper. Dampening the surface raises the grain, causes surface fibers to stand vertically, or near vertically. In this position they are easily cut off in the next step. On very fine work this procedure is often carried through several steps, to properly condition the wood for a "piano" finish.

sanding by machine

Machine sanding with a portable electric sander is much the same thing except that it's faster and requires a little closer attention to control of the tool. Generally a portable belt sander is best for average work on flat surfaces, one having a 3-in., or wider, belt being somewhat easier to control when using fast cutting abrasives in the coarser grades. If the surface to be sanded is in reasonably good condition, no digs, gouges, dips, or ridges, then use of a coarse-grade abrasive may not be necessary. Make sure that the belt you use tracks properly when in place on the sander and be sure to check to see that it's running in the right direction. All sander





Photos courtesy Minn. Mining & Mfg. Co.

NYLON ABRASIVE PAD works on either metal or wood equally well. Just the thing for cleaning and "shining" up aluminum canoes, boat brasswork, door kick plates, or metal turnings. Fold or cut the nylon pad to a convenient size and use as you would sandpaper.

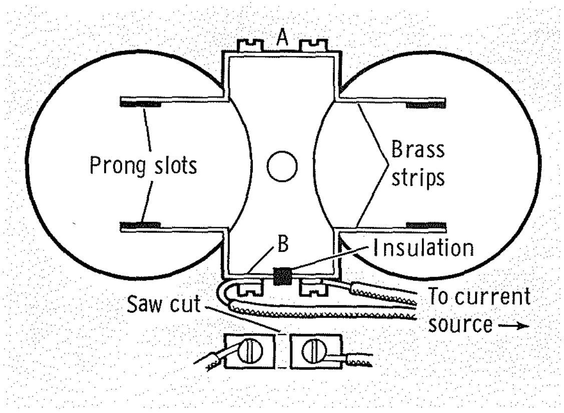
belts are marked with an arrow indicating the direction they are to be run.

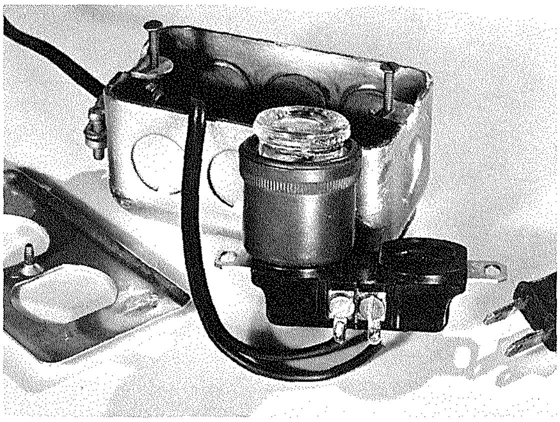
Start the sander before lowering it onto the surface to be sanded and keep it moving after contact in slow, back-and-forth strokes much the same as in hand sanding, the strokes overlapping slightly and working either to right or left. Don't allow the unit to stop on the surface, even for an instant, and be especially careful to prevent it from tipping sidewise. If the unit is stopped momentarily, or permitted to tilt slightly, the coarser-grade abrasives can cut through thin veneers in the wink of an eye, or form a depression that's difficult to sand out. Just as in hand sanding with a block, be doubly alert to avoid over-running the edges and ends of the work.

Don't bear down on a belt sander. Usually the weight of the unit is sufficient to keep the belt cutting freely. If it seems necessary to urge it a little, as in sanding end grain perhaps, bear down only very lightly and keep close watch of results. Bearing down heavily may cause the belt to heat unduly and glaze, thereby greatly reducing its efficiency. Once the surface has been leveled satisfactorily—use that finger test again—change to a finer grade belt, continuing to step down until you finish with the finest belt.

Pad sanders are of two types, the terms, or names, used referring to the action of the pad. In the orbital type the pad moves in a circular stroke. On the second type known as the straight-line sander the pad moves in a straight, back-and-forth stroke. On some later-model pad sanders the stroke can be changed from straight to orbital as desired. Pad sanders are generally used for the finishing steps with fine-grade abrasives as they are capable of sanding to a very smooth surface.

In general, stance is of some importance in both hand and machine sanding. Some prefer to stand at the side of the work when hand sanding as they can keep pressure and stroke more uniform on a relatively large surface. Working with a portable belt sander can be done in much the same position. Hand pressure is not necessary with the power unit, leaving the hands free to control direction and limits of the stroke. On some woods, especially those with a coarse, open grain, you'll get a somewhat smoother job by directing the strokes slightly diagonal to the grain through all the steps from coarse to fine. This will be true of both hand and power sanding. Also, it's advisable to do a little experimenting to determine the grades of sandpaper that do the best job from start to finish on a given wood.

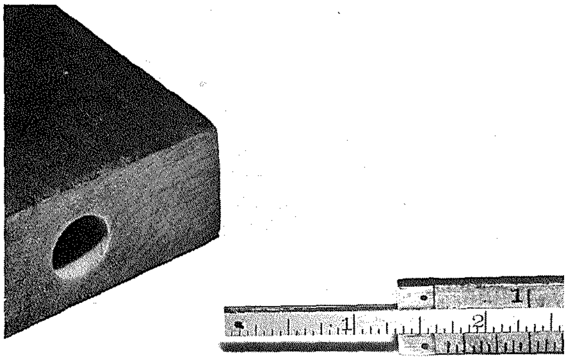




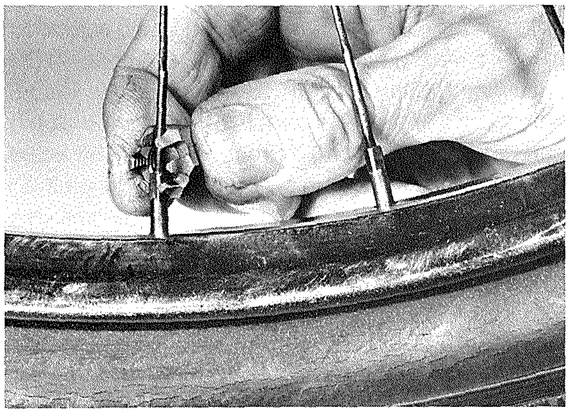
A SIMPLE CHANGE converts any electric receptacle in your workshop to a separately fused safety circuit.

To convert the receptacle you must wire the two pairs of outlet slots (normally connected in parallel) in series. With a hacksaw cut one of the brass strips between its two wire-holding screws. Make the slot as wide as possible, and fill it with insulating fiber. Apply insulating varnish or shellac to this wedge. Now connect each wire of the current-supply cord to one of the two screws shown at B in the drawing. No connections are required at point A.

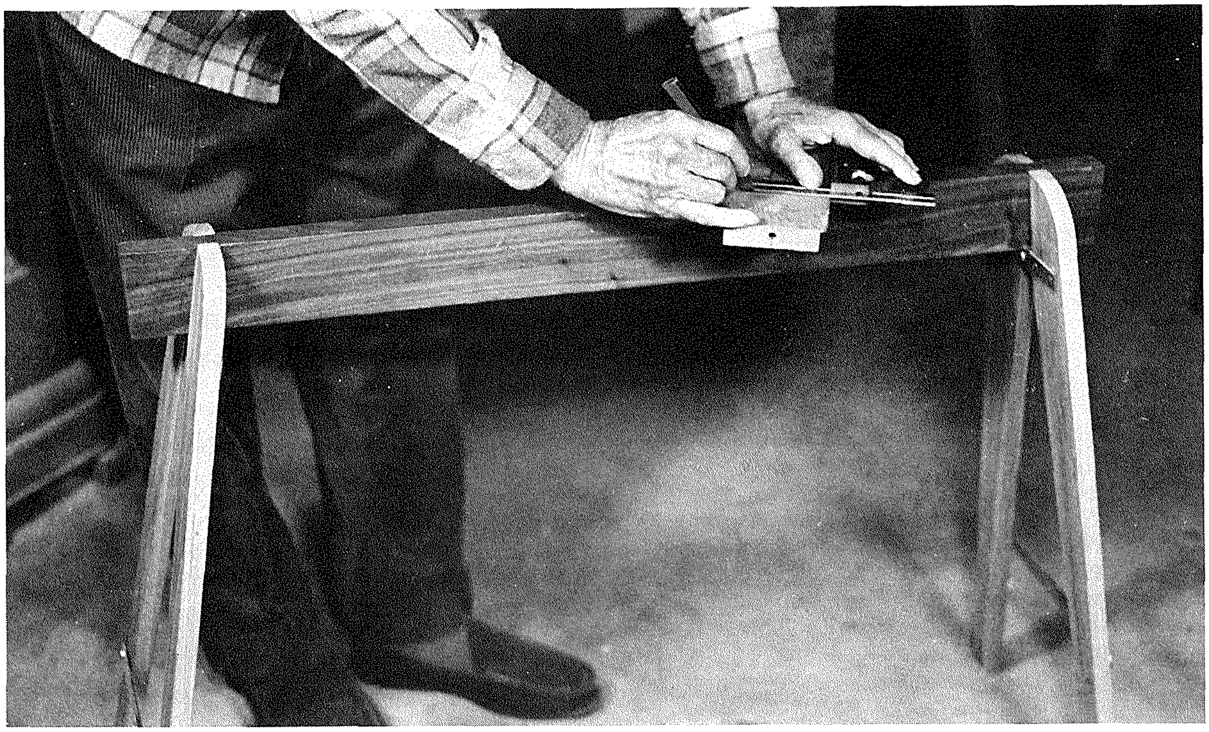
Mount the outlet in a standard box. Insert a lamp socket adapter into a receptacle and install a fuse of lower rating than the circuit fuse. Plug a suspected appliance in the other receptacle, and see if the fuse blows.—*Henry R. Rosenblatt.*



WHEN IT COMES to taking an inside measurement with a zigzag rule which has sliding extension, you already know how handy such a rule can be. But do you know that this same sliding brass extension can be handy too for checking the depth of dowel holes? Since the extension is narrower than the rule itself, the end of the rule provides a shoulder. Thus all you have to do is insert the extension in the hole and press forward until the rule touches the work.—*Richard K. Rogers.*



A BICYCLE-SPOKE TIGHTENER is a tool you seldom need. Even if you have one, chances are you can't lay your hands on it right away. But when you need one, it's hard to find another tool that will do. Here's a substitute you probably can find in your drawer of miscellaneous hardware: Select a castellated nut with slots that are ⅛ in. wide. You'll find the slots fit the spoke nipples perfectly, and you can easily tighten or loosen them with this makeshift wrench.—*Joe Dettling.*



A simple-and-easy sawhorse

Two twists of your wrist reduce this fine, firm sawhorse to a small bundle of boards you can store anywhere, or tote easily to a remote job

By W. CLYDE LAMMEY

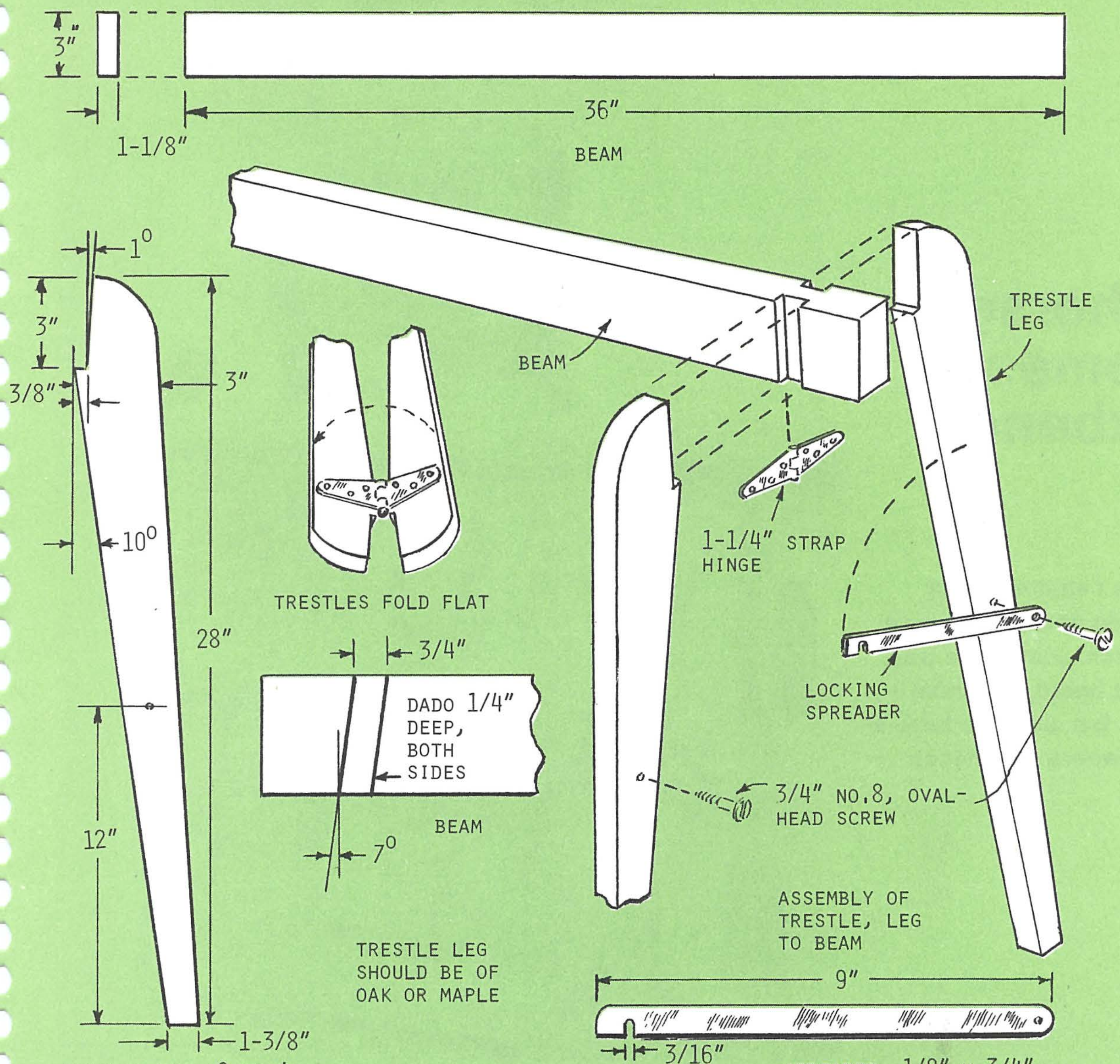
▧ IT TAKES DOWN and sets up in seconds. The legs fold flat in pairs, so you can stand them in a corner where shop space is limited. Or you can toss them into a pickup or the car trunk with room to spare. Set up, these horses will take heavy loads, shoves, knocks and poundings.

The beam is straight-grained hardwood—oak or maple is best—and ¾-in. oak should be used for the legs, or trestles. These are made in pairs, and care must be taken to make quite precise duplicates. Two legs are hinged together as indicated and the beam is dadoed at both ends, each dado being made at an angle of about 7 degrees. When making the dadoes, cut them with square, true shoulders and just a hair's breadth wider than the thickness of the leg stock. And be sure to cut a uniform depth of ¼ in.

After you have shaped the legs, clamp them in place in the dadoes and screw the strap hinge to each so that the pin just touches the lower edge of the beam. Then make the spreader as indicated from flat steel—sometimes referred to as band iron—and screw it to one leg. Then, with the legs in place spread them, swing the spreader down into position and mark the location of the screw which slips into the slot at the free end of the spreader. The trick here is to position all the parts and then exert a little extra pressure so that when the spreader is locked in place the upper ends of the legs in the dadoes will grip the beam tightly. This will assure that when you pick up the horse or move it about, the trestles will stay solidly in place.

The length of the beam, the height of the trestles and the finish are your options. For rough work there need be no finish at all, but for use in a "show" workshop you can stain and varnish to whatever color suits your fancy.

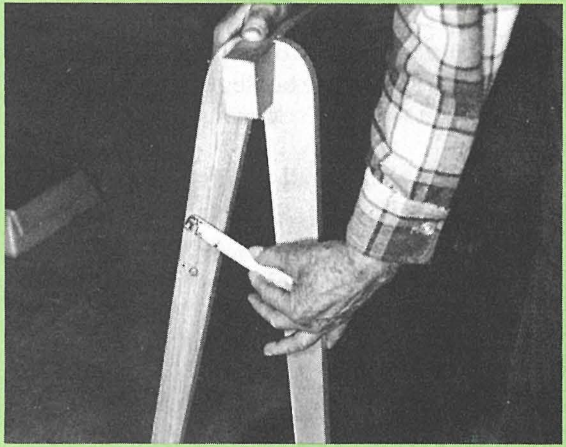
SEE ALSO
Apartment workshops . . . Workbenches . . . Workshops

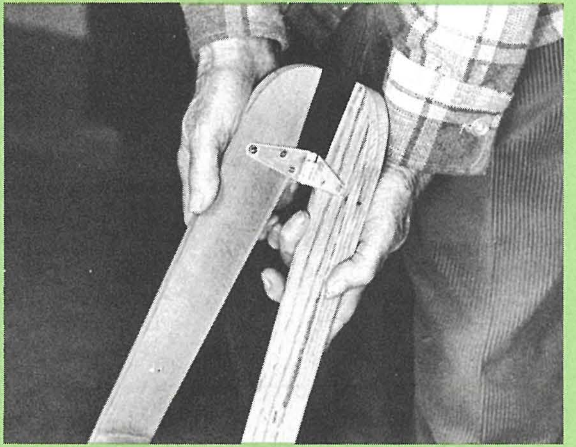


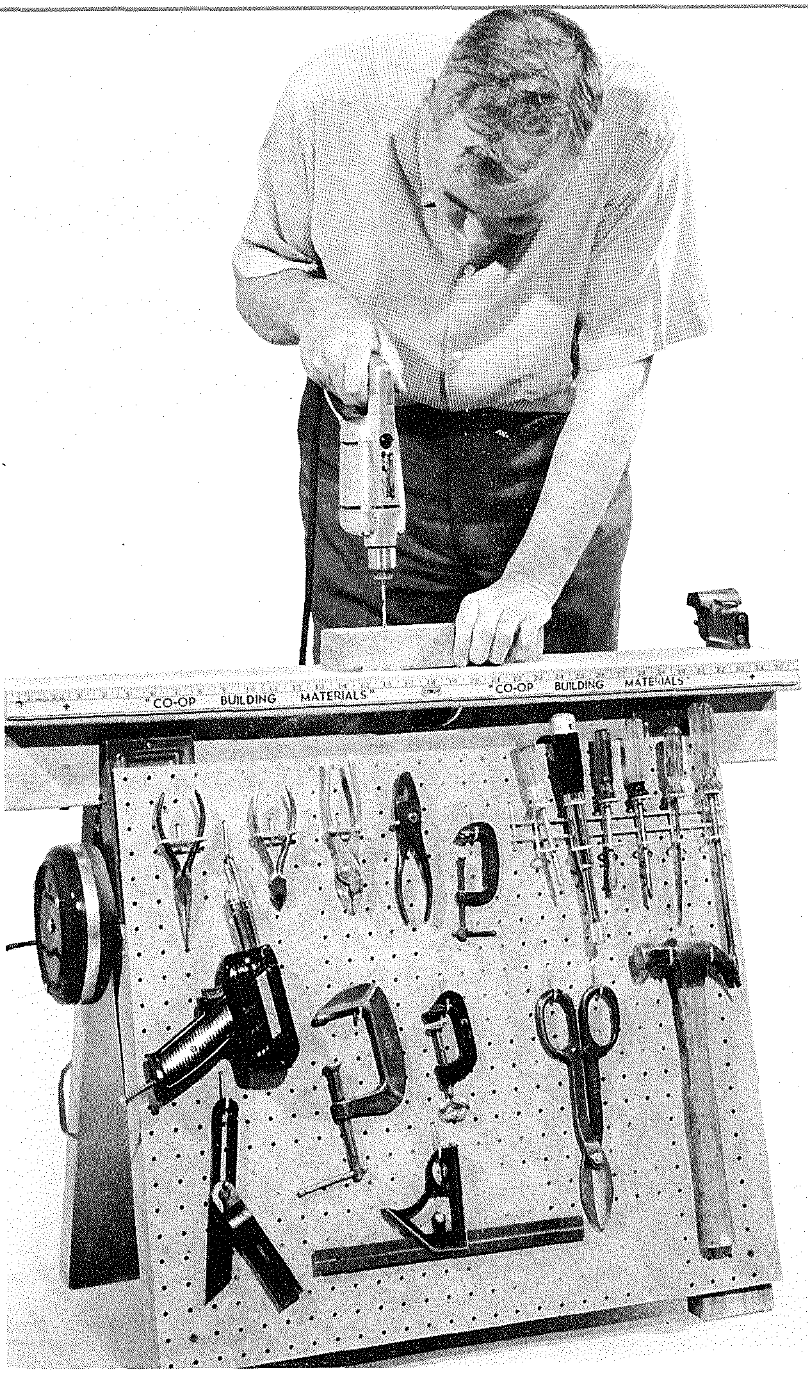
TRESTLE LEG SHOULD BE OF OAK OR MAPLE

TRESTLE LEG, 8 REQ'D. FOR PAIR OF SAWHORSES

SPREADER, 1/8" x 3/4" FLAT STEEL, 4 REQ'D.







Sawhorse becomes a workbench

You can make your sawhorse do double duty as a workbench. Just add a tray, perforated board, electrical outlet, a top, and you have a go-anywhere workbench

▨ A SAWHORSE need not be just a sawhorse; it can be the handiest home-repair "workbench" you ever saw. Fitted with a flat top, it provides a benchtop surface for all kinds of layout work, plus a place to clamp a vise.

When a shallow tray is fitted between the legs, you can keep your hand tools, nails and screws all in one handy place such as a toolbox.

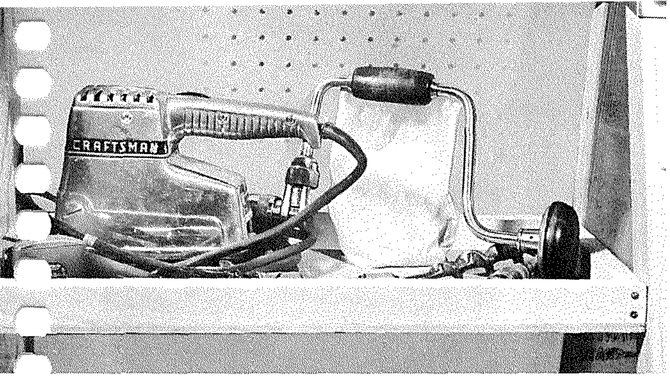
SEE ALSO

Apartment workshops . . . Tool carriers . . . Toolboxes . . . Workbenches . . . Workshops

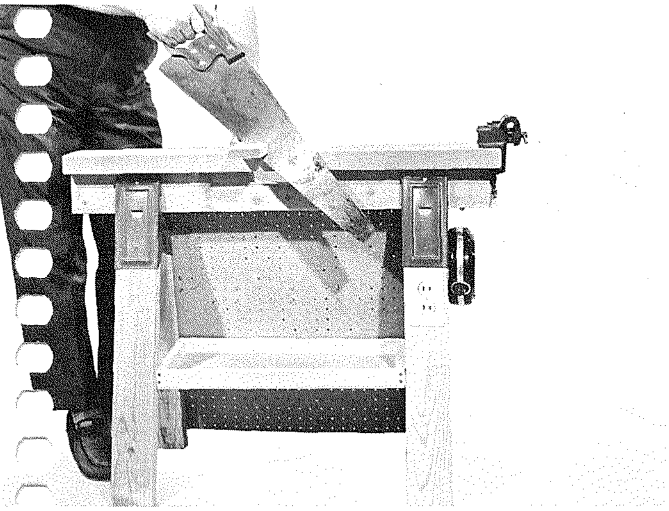
When a piece of perforated hardboard is fastened to one side of the horse, you have a built-in tool panel on which to store countless small tools with clips.

And when you install a duplex receptacle in one of the sawhorse legs and wire it to a retractable power-cord reel, you have convenience plus when plugging in power tools.

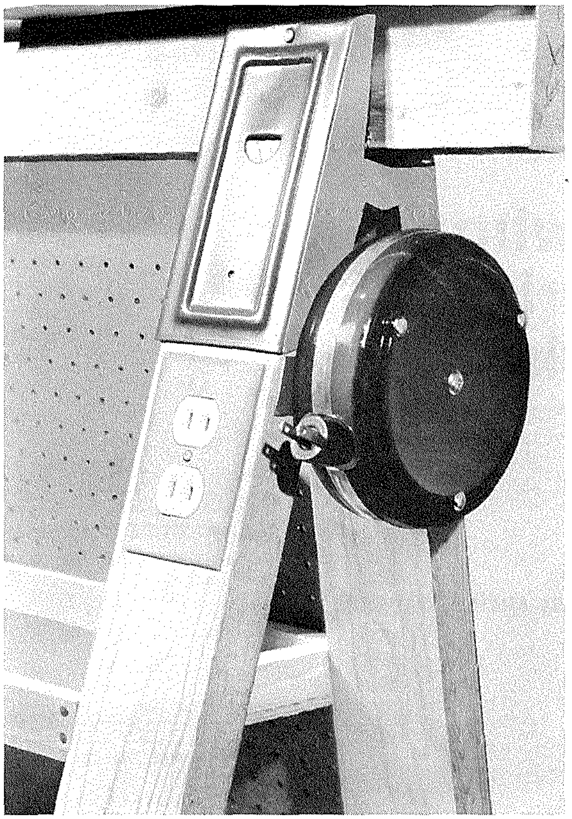
To add such a receptacle, an outlet box is first installed in the leg in a cutout made to receive it. The female plug is cut off the end of the cord reel and the line is attached to the outlet box with a Romex connector. Finally, the receptacle is installed in the box, which is then fitted with a plate.



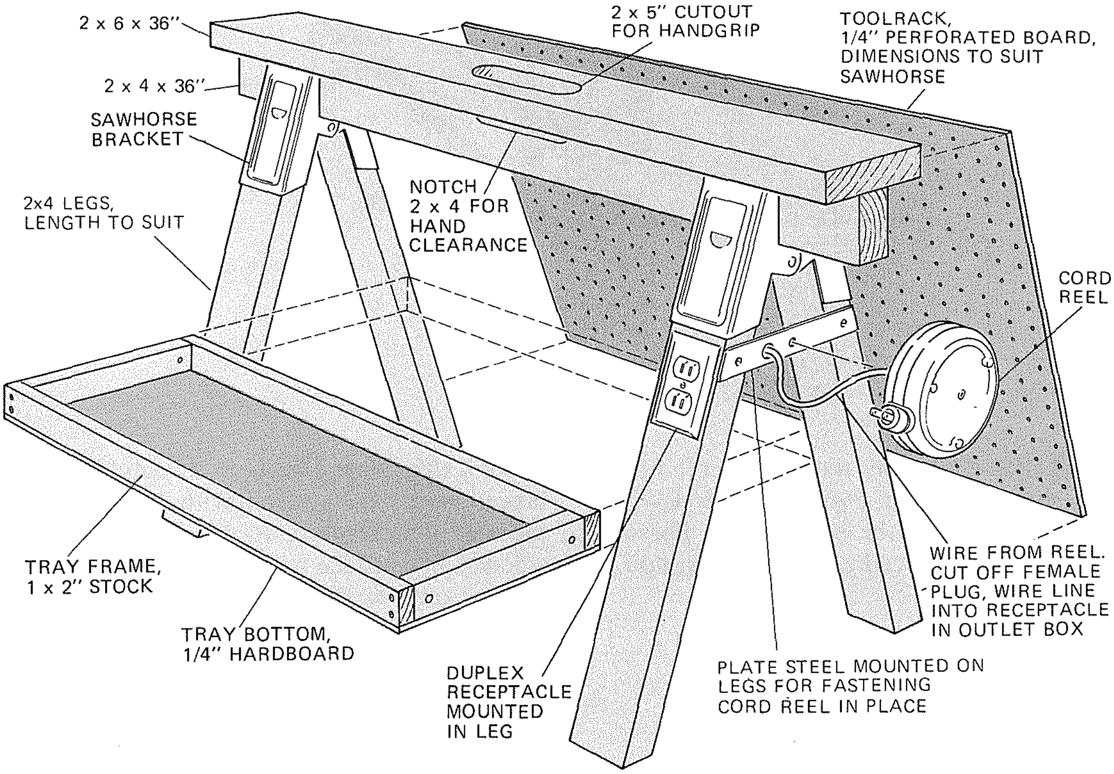
THE TOOL TRAY is permanently affixed—and adds rigidity—to the sawhorse legs. It offers a good storage area for portable tools, small parts, screws and nails.



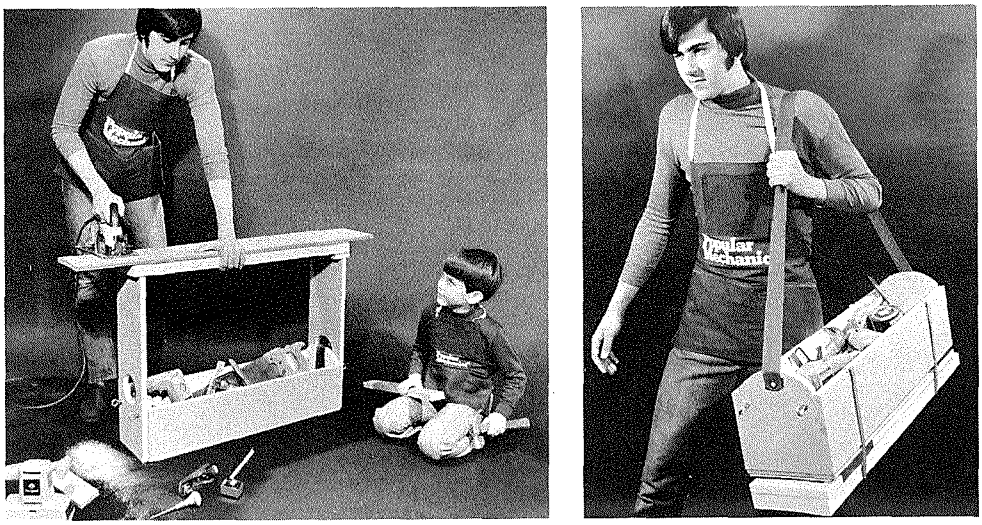
THE TOP WORK SURFACE is simply a bolted-on length of 2x6; ample for drilling, sawing and most other carpentry jobs.



AN ELECTRICAL OUTLET BOX is installed in one leg, with the line from a cord reel connected to the receptacle. The other end of the line is plugged into a power source.

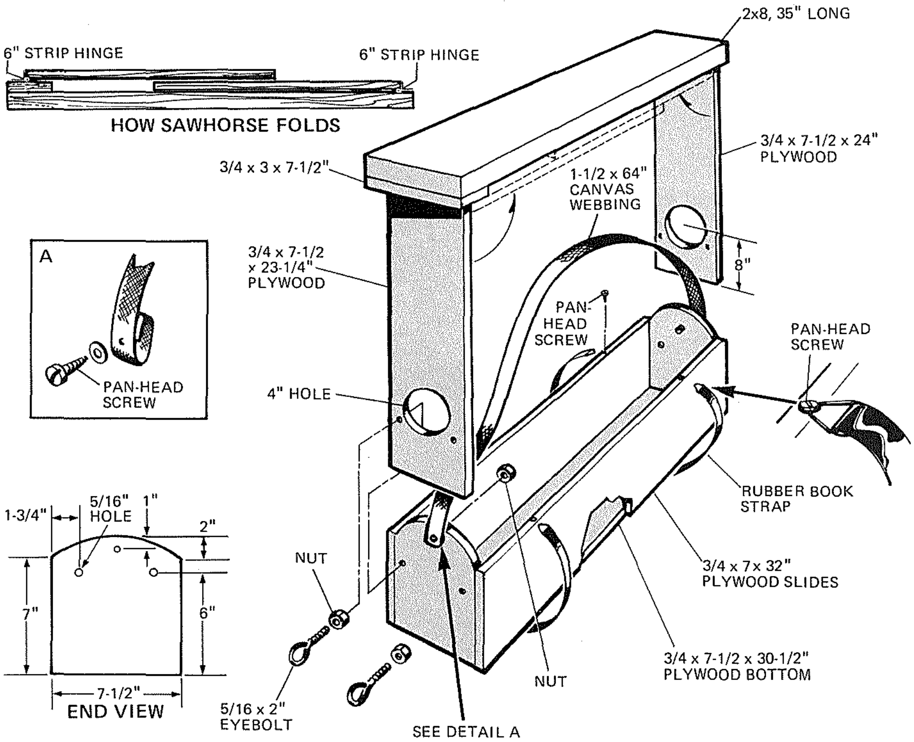

2 x 6 x 36"
2 x 4 x 36"
SAWHORSE BRACKET
2x4 LEGS, LENGTH TO SUIT
2 x 5" CUTOUT FOR HANDGRIP
TOOLRACK, 1/4" PERFORATED BOARD, DIMENSIONS TO SUIT SAWHORSE
NOTCH 2 x 4 FOR HAND CLEARANCE
CORD REEL
TRAY FRAME, 1 x 2" STOCK
TRAY BOTTOM, 1/4" HARDBOARD
WIRE FROM REEL. CUT OFF FEMALE PLUG, WIRE LINE INTO RECEPTACLE IN OUTLET BOX
DUPLEX RECEPTACLE MOUNTED IN LEG
PLATE STEEL MOUNTED ON LEGS FOR FASTENING CORD REEL IN PLACE

Sawhorse carries tools



WITH A SAWHORSE strapped to the bottom of your toolbox, you are never without a suitable bench to work on when home-repair jobs take you away from your shop.

By ARTHUR CASSIDY



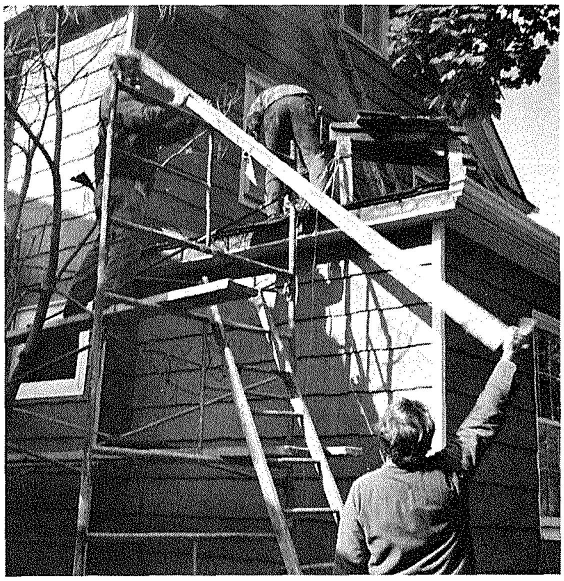
WITH THIS UNIQUE toolbox you'll not have to wish you brought along a sawhorse—it totes one. Strapped to the bottom is a horse that's there when you need it. To set it up, you unhook the straps that hold it, unfold its three hinged pieces and attach it with thumbscrews to the ends of the toolbox. Its wide 2x8 top provides a dandy flat surface for sawing and hammering, and the toolbox provides a sturdy, stable base. When the job's done, you pack up and sling the box over your shoulder.

Rubber book straps are used to lash the sawhorse to the box, and a length of canvas webbing is used for the sling. Holes in the sawhorse uprights clear the ends of the sling.

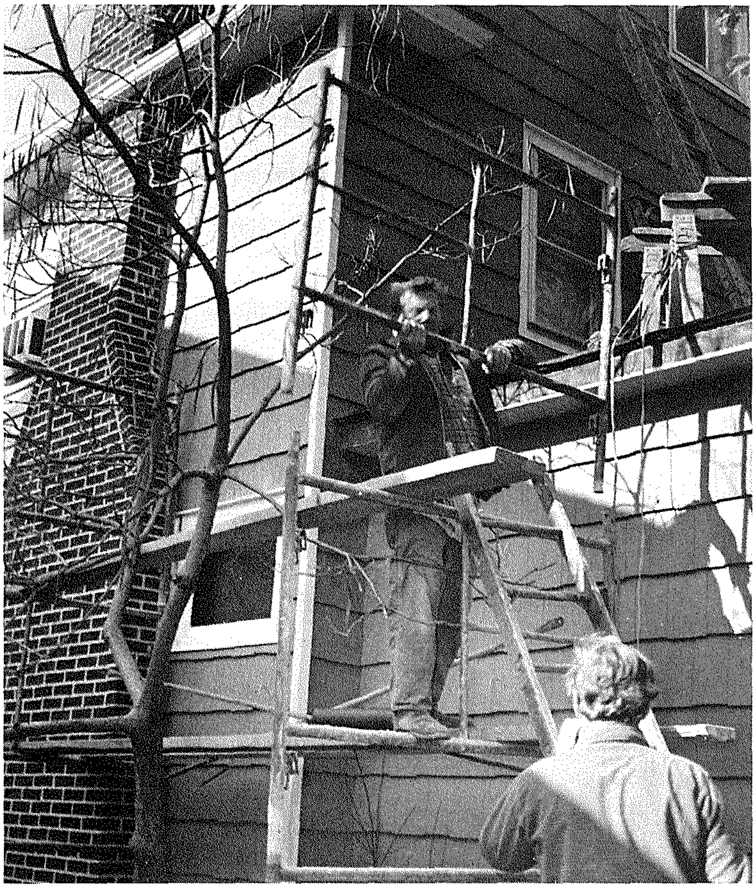
SEE ALSO

Apartment workshops . . . Tool carriers . . . Toolboxes . . . Workbenches . . . Workshops

ONCE SCAFFOLDING IS IN PLACE, materials for application on the house front can be safely hoisted up via it and a ladder leaned against the house.



THE LAST LEVEL of planking for a two-story home is passed up so the side can be finished. The safety grab rail is put in place after the planking is up.



WHILE WORK PROGRESSES on the front (second floor), the scaffolding goes up alongside for safety and ease of corner shingling. Platform scaffold is shown.

How to rent and work from scaffolding

By HARRY WICKS

Installing siding is just about impossible without some type of scaffolding. You can rent what you need from your local rental outfit. Here's how to use it safely

SEE ALSO

Ladders . . . Painting, exterior . . . Sheathing . . . Siding

UNLESS YOUR HOME is one story high, when you plan your re-siding job you should figure it will be necessary—and desirable—to rent scaffolding. Besides being unsafe, it is practically impossible to nail up most siding materials from a ladder. You need one hand (at least) to hold the materials, another to swing the hammer and a third for holding onto the ladder.

Though re-siding a house cannot be put in the "fun job" class, scaffolding will make the chore as bearable as possible because: 1) You can bring tools and worktable right to the job; this

Some scaffold safety rules

Below are some common-sense safety rules designed to promote safety in the use of steel scaffolding. They do not purport to be all-inclusive or to replace other safety rules intended for usual or unusual job conditions.

Always use adjustable screw-type plates instead of blocking to adjust to uneven grade conditions.

Always plumb and level scaffold as erection proceeds. Do not force braces to fit. Level and move scaffold until the proper fit is made easily.

Always fasten all braces securely.

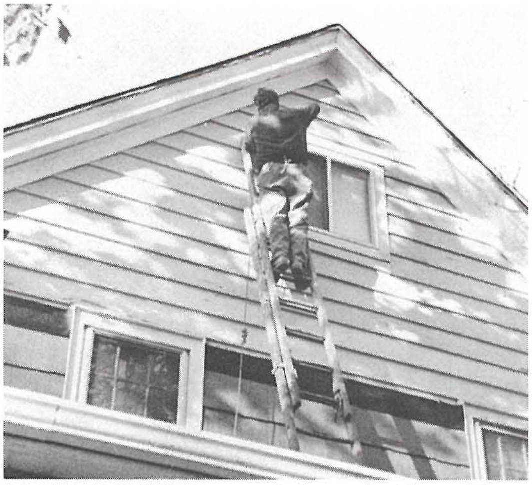
Always use caution if erecting steel scaffolding near overhead power lines.

Always secure planking with nails where it overlaps on the scaffold run. Planking should be immovable.

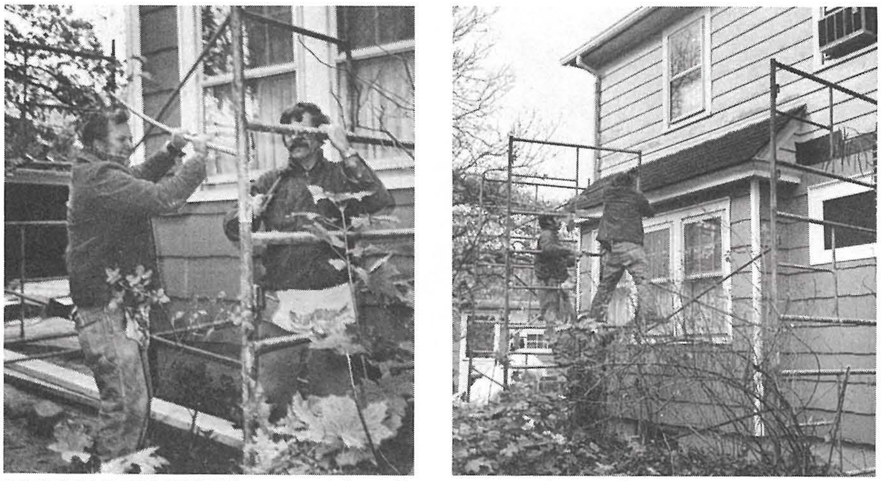
Never use ladders or makeshift devices on top of scaffolds to increase height.

Never overload a scaffold. For weight limits, consult renter.

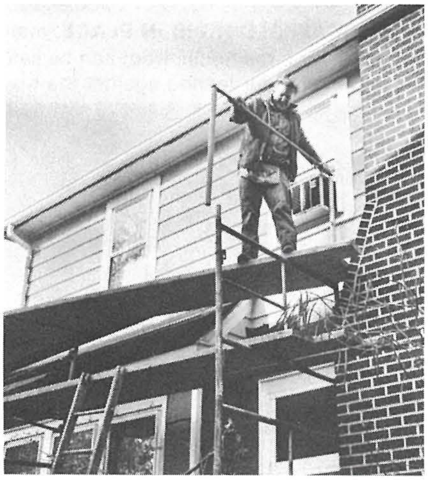
Never allow unsupported ends of plank to extend an unsafe distance beyond supports.



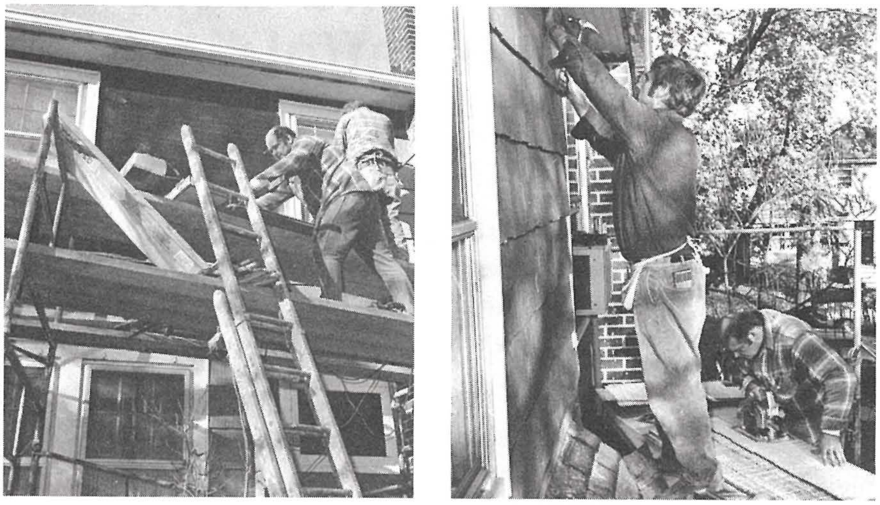
A LADDER IS USED to reach the peak at the gable end. It, in turn, rests upon a plank held by roof brackets fastened to the porch roof.



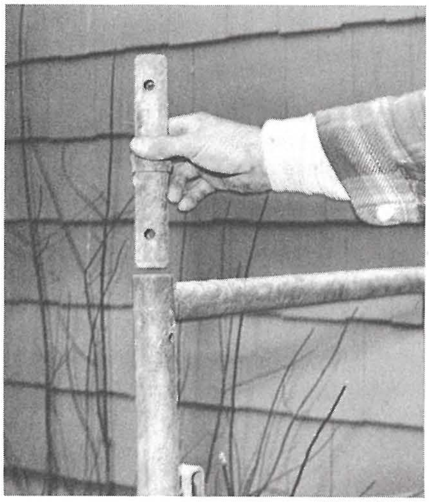
SCAFFOLD ERECTION goes quickest if two men work together (left). In the center photo, the next tier is added so planks can be moved up to the highest area.



PLANKS ARE PLACED on platforms and the grabrail is installed. It's a must to use a grabrail at each end to prevent an accidental walk off the scaffold.

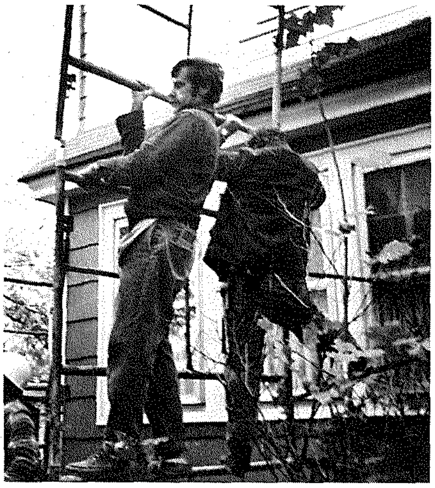


A ROOMY TWO-LEVEL SETUP lets you bring the worktable and tools to the job. Center: Adequate-width planking gives feeling of security despite the height.

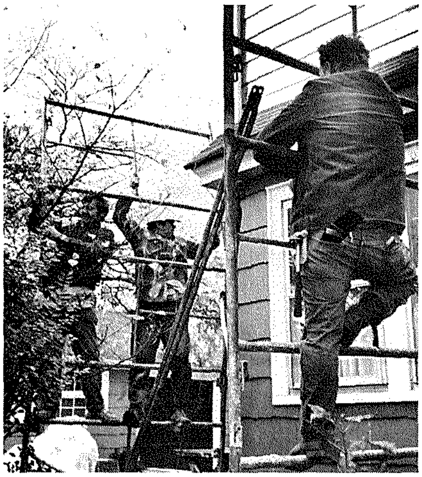


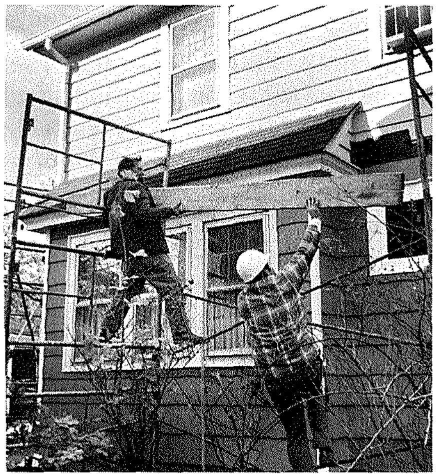
AN INSERT-PIN is used at all joints between the end platforms. Pins are not "fixed" in the legs, but simply slide in and out of the tubular framing.

THE SCAFFOLDING required a bit of maneuvering on this side of the house because of a cantilevered window section. It took three men 20 minutes to assemble.



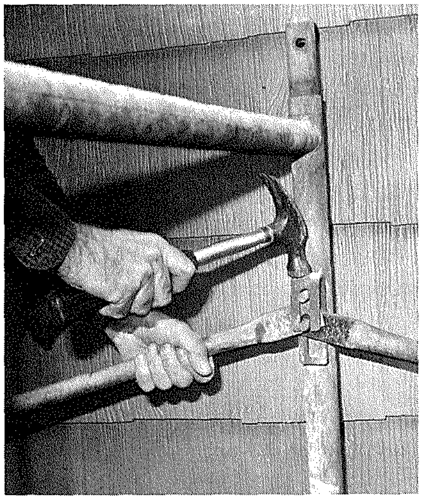
THE MIDDLE TIERS of platforms (center photo) go up simultaneously with the end tiers. Right: The second level can be handled easily from the ground.

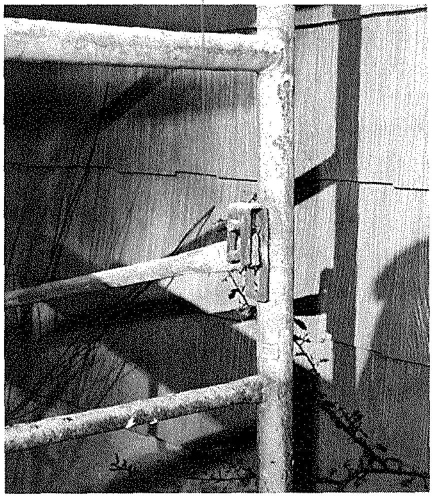




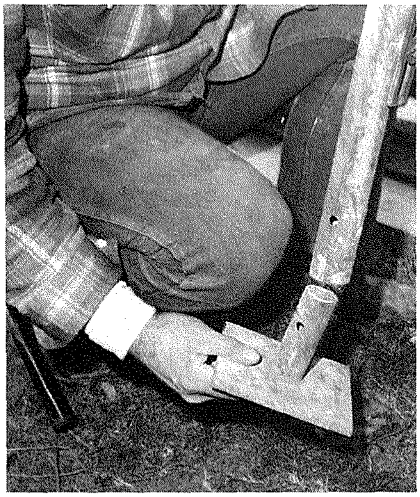
TWO PAIRS OF DIAGONAL BRACES are used between the platform end frames. Until diagonal braces are secured, the insert-pins keep sections from falling.

EACH PAIR OF BRACES is connected and pivots at the center. Once these are installed (see below) the scaffolding is rigid and planking can go up (photo right).





A DIAGONAL BRACE is slipped over the stud on the platform leg (left), and brace-lock is tapped into position. Center: The brace stays put until you remove it.



BECAUSE THE GROUND is level, rigid base-plates are used. If the grade is uneven, leveling-type jack-plates must be used to keep the scaffolding level and plumb.

continued

will eliminate time-consuming trips to tools when cutting and fitting. 2) Siding material can be brought up in sizable amounts and kept close at hand. 3) Most important, you can work in comfort and safety. Erected properly, platform-type scaffolding gives a sidewalk-like area underfoot.

The easiest scaffold to work with, and in my opinion the only type scaffolding a homeowner should use, is the platform-type shown. The jack-type, which most professional roofers and siding installers use, is not recommended for the inexperienced. The possibility is all too likely that one of the two men pumping the jacks will pump faster or slower than his partner. The result will be a couple of fallen workers. Neither should an amateur attempt to use scaffolding to span a first-floor roof. Instead, plan to use ladders to reach the area above that roof, with a helper feeding siding to the installer.

Ladders, of course, must be set upon a flat, level surface. To gain such footing for a ladder on a roof, it will be necessary to rent a sufficient number of roof brackets along with the scaffolding. A roof bracket is installed by lifting a shingle tab and partially driving-in a nail (at least 10d common). The bracket keyhole slot is then slipped over the nailhead and the nail driven home to secure bracket. When relocating a setup, you simply pull up on the bracket, slip it off of the nail and drive the nail home. You'll need two roof brackets and a scaffold plank for each planned ladder setup. For added safety, the ladder can be toenailed or clamped to the plank.

use your phone book

To rent a scaffold, look in the classified directory under *Scaffolding*. Most outfits rent the scaffolding on a monthly-fee basis regardless of how long you plan to hold onto their equipment. Plan your job—weather permitting—so scaffolding can be returned within a month.

For example, I sided the entire first floor of my house before ordering the scaffold. Then, I ordered it so the delivery would be on a Thursday. This gave me Thursday night to make certain that all parts ordered were on the job. If parts had been missing, I would have had Friday (instead of wasting work hours on Saturday) to pick them up.

By 7:30 a.m. Saturday, two friends and I were assembling the scaffolding. By 8:00 we were applying siding. We repeated the procedure the following Saturday and by 5:00 p.m. the job was finished.

The scaffolding was disassembled, checked and stacked and Monday the scaffold outfit was called to pick up its equipment. Total time on the job: 12 days.

For safety between our Saturday work sessions, we took down the scaffolding immediately after each workday. There was too much chance of neighborhood kids climbing and falling.

As mentioned before, most outfits rent scaffolding by the month. After determining exactly what equipment will be needed, a cash figure is worked up. (The renter will calculate what equipment you will require but he will need some information supplied by you.) Bring along a plan drawing of your house. All measurements (lengths of run of each wall) should be on this drawing. Also, you must know the height of your home; the higher you go, the more platform sections you will need.

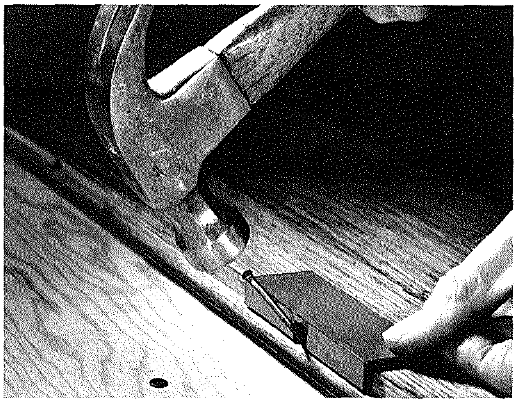
For my job—the longest stretch of wall was 25 ft.—a setup with a 27-ft. run would handle the job adequately. To get us up to the 22-ft. height, scaffolding had to go up to 16 ft. Thus, four platform-tiers (10-ft. planks were used in two bays, and seven footers in the third) four sections high would do the job (each section is 4 ft. high). With number of platform sections determined, it is easy for the renter to determine the number of insert-pins, diagonal braces, safety rails, and the like, required.

use your common sense for safety

When working on a scaffold, safety is the watchword and, for the most part, so is plain common sense. Always make certain that your ascent/descent ladder rests squarely against the scaffold planks and is planted properly at the ground. Because tools and materials may be dropped occasionally, the man doing the hauling up of materials should wear a hard hat. And, don't let debris accumulate on the planks. Periodically stop and do some "housecleaning."

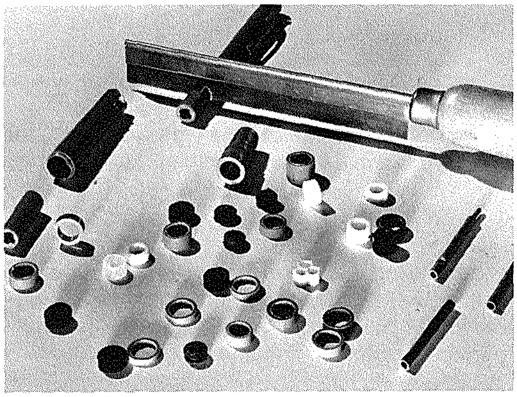
Don't start work before you put the safety grab rails in place atop the two end platform sections. It is easier than you might suspect to become so involved in your work that you accidentally step off the scaffold.

Finally, where scaffold planks from one bay overlap those in the next, use common nails to tie the sections together. The nails can be driven at an angle (toenailed) through the edge of the plank on top into the one below. You needn't drive nails home. It's better—for easier disassembly—to leave nailheads protruding slightly.

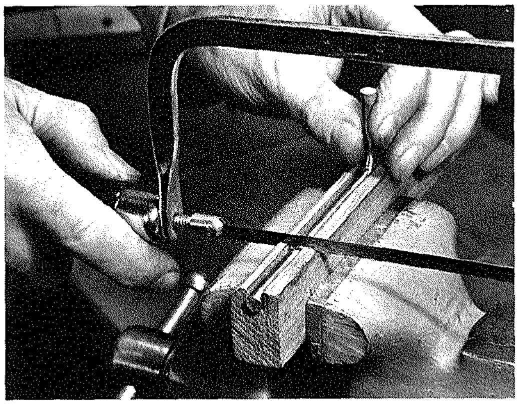


WHEN NAILING STRIPS of tongue-and-groove flooring, protect them from denting hammer blows with this simple shield. It's just a 3 or 4-in.-long section of angle iron with one leg cut to the height of the tongue to the face. The center of this shortened leg then is notched for the nail. Even if you should miss the nailhead, the angle will absorb the force of the blow.

WHEN FILLED WITH INK or paint, a spreader-type glue bottle will make it easy to address shipping crates or cartons. Just press the rubber cap of the bottle down against the crate so ink begins to flow, then draw the cap through the ink to form the necessary letters or numerals. Just be sure to apply only light pressure to avoid covering the surface of the crate with unsightly and unreadable blobs of ink. Show this trick to your children—it will help them make school posters.



OLD BALLPOINT PENS can be made into useful items for your workshop supply. Remove the ink cartridge and all metal fittings, then slice the body, cap and even the ink cartridge into segments of assorted lengths. The result is a collection of plastic washers and spacers useful for building or repairing different projects. Some of the rings and spacers shown at the left were cut from the body or cap using the saw shown, while others were cut off on a lathe.



TO SQUARELY CUT sections of small-diameter tubes or thin, limber rods, clamp a suitable length of tongue-and-groove flooring in a bench vise so that the groove side faces upward. Cut a fine kerf across the lips of the groove, much like the slots in a miterbox. Then just position the tube or rod in the groove so the cutoff point is aligned with the fine kerf and saw through the work with a hacksaw. Supporting the work this way also prevents it from becoming marred in the vise jaws.

Build a mobile scaffold

By JOHN A. IAMONACO

This simple movable platform not only speeds the job of painting and repairing your house but also cuts the risk of accidents. It can be made easily and inexpensively and disassembles for flat storage

▨ PAINTING FROM a scaffold is both safer and more efficient than trying to do the same job while standing on a ladder. Your footing is more secure. Also, you can cover much larger areas before having to climb down and move the scaffold. With less time spent moving equipment, the job goes a lot faster.

The simple scaffold detailed on the facing page costs very little to build. Basically, it's just two 8-ft. ladder-type sections connected by a pair of X-braces. One section is equipped with wooden wheels to simplify moving the scaffold from one painting location to the next. If available, you could just as well substitute wheels from a discarded wagon or tricycle.

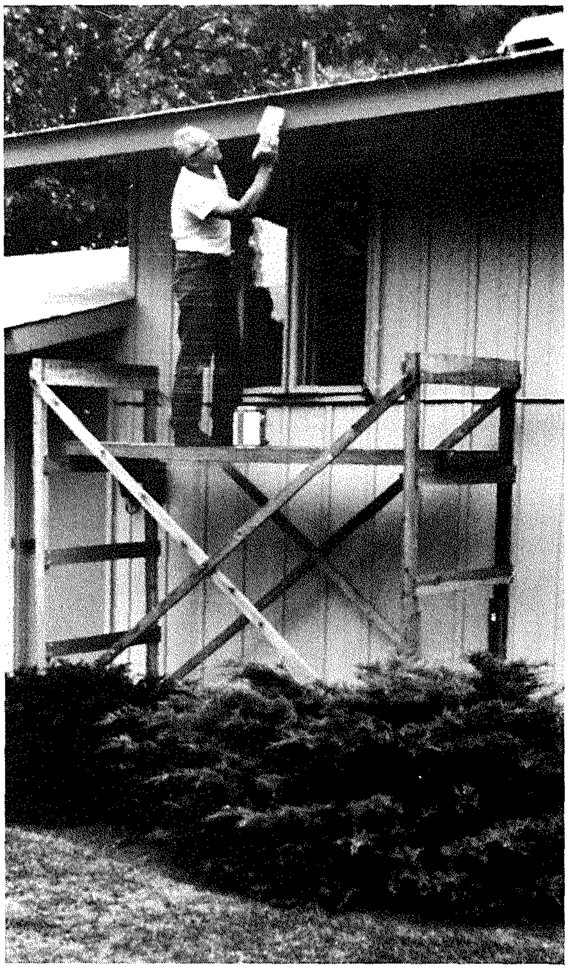
The other ladder section features adjustable legs which make it possible to use the scaffold on uneven ground. Extension units for both ladder sections allow you to increase the height of the scaffold to 12 ft.

The box-type platform shown in the plan has the advantage of being much lighter than a solid plank. Retainer studs on either end fit over the ladder rungs and prevent the plank from slipping. Rung spacing permits placing the plank at height intervals of 2 ft.

When not in use, the scaffold can be disassembled and stored flat. Simply remove the wingnuts from the eight anchor bolts securing the X-braces and fold the braces together. Once you've taken it apart, the scaffold is compact enough to store in your garage.

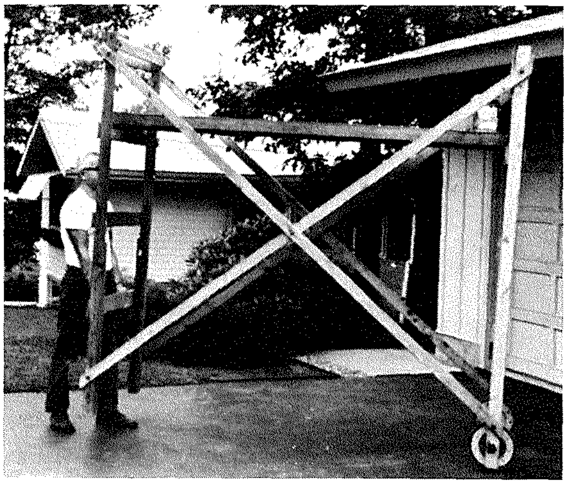
SEE ALSO

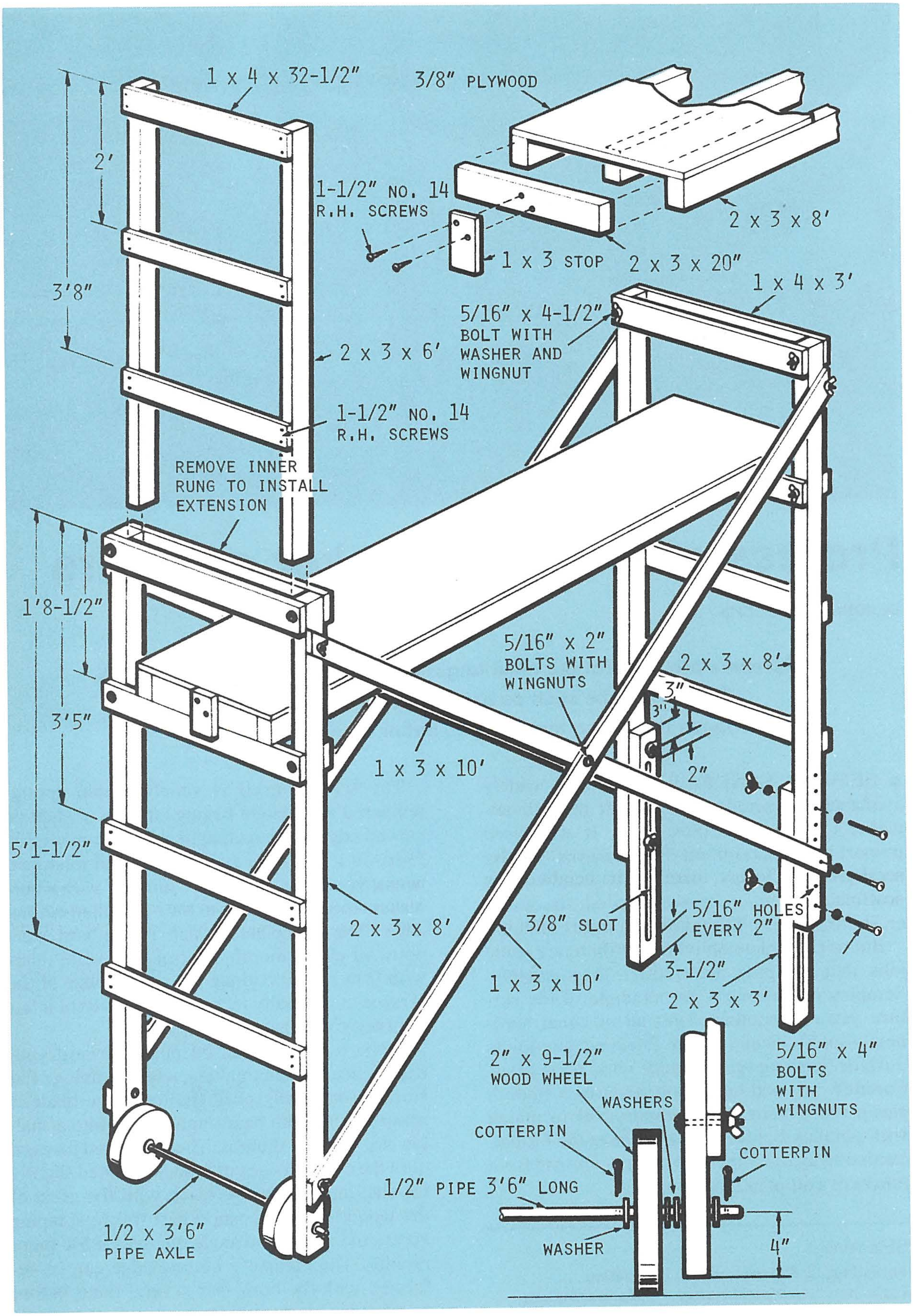
Ladders . . . Painting, exterior . . . Sheathing . . . Siding

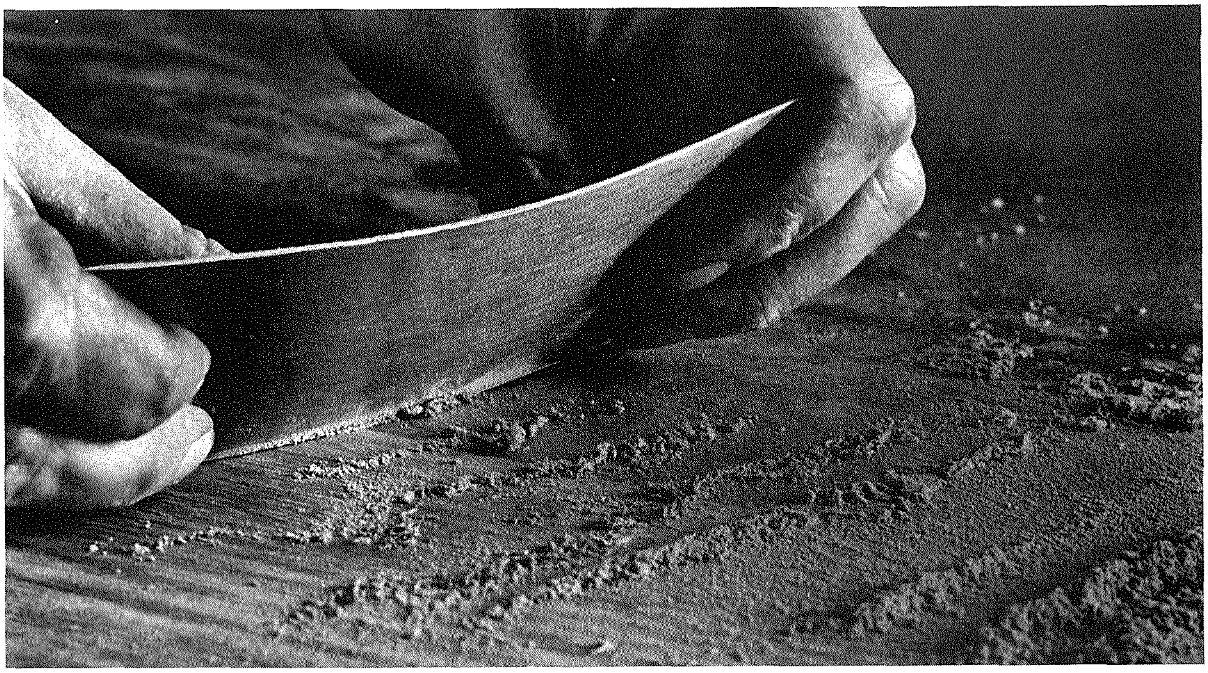


PAINTING EAVES of this split-level home is just as easy as ground-level work when the scaffold is used. With extension units added to the ladder sections, the painting platform can be raised as high as 12 ft.

WHEN YOU want to move the scaffold to another spot, simply lift one ladder section and trundle it along on the wheels. While designed for painting, the scaffold is also perfect for construction and repair jobs.




1 x 4 x 32-1/2"
3/8" PLYWOOD
2'
1-1/2" NO. 14
R.H. SCREWS
2 x 3 x 8'
1 x 3 STOP
2 x 3 x 20"
3'8"
1 x 4 x 3'
5/16" x 4-1/2"
BOLT WITH
WASHER AND
WINGNUT
2 x 3 x 6'
1-1/2" NO. 14
R.H. SCREWS
REMOVE INNER
RUNG TO INSTALL
EXTENSION
1'8-1/2"
5/16" x 2"
BOLTS WITH
WINGNUTS
2 x 3 x 8'
3"
3"
3'5"
1 x 3 x 10'
2"
5'1-1/2"
2 x 3 x 8'
3/8" SLOT
5/16" HOLES
EVERY 2"
1 x 3 x 10'
3-1/2"
2 x 3 x 3'
2" x 9-1/2"
WOOD WHEEL
5/16" x 4"
BOLTS
WITH
WINGNUTS
WASHERS
COTTERPIN
COTTERPIN
1/2" PIPE 3'6" LONG
1/2 x 3'6"
PIPE AXLE
WASHER
4"



Professional cabinetmaker scrapers

By JOHN BURROUGHS

Scrapers are some of the most forgotten and misunderstood handtools. There are jobs such as paint removal or smoothing certain surfaces that these tools can do better than power sanders

■ BEFORE SANDPAPER became widely available, the scraper was one of the cabinetmaker's more important tools. It was used primarily to smooth off blade marks left by hand-planing. Today, since most woodwork is now machine-cut and power-sanded, the scraper, unfortunately, has fallen into near oblivion.

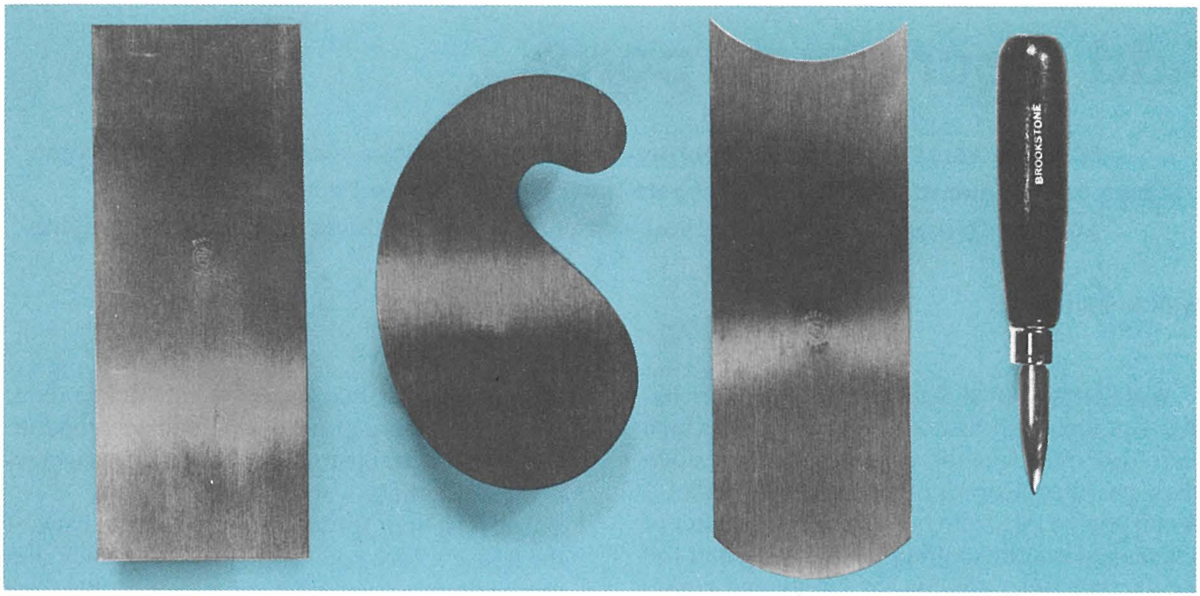
But not complete oblivion, for there are some jobs that scraping does better than sanding. Scraping is preferable, for example, if the surface you're smoothing isn't all of equal hardness—such as when you're finishing glue-joints flush or finishing repairs made with wood filler. Carefully scraped hardwood acquires a smooth gleam that's hard (if not impossible) to match with sanding. Scraping is sometimes the fastest, cleanest way to remove old paint or varnish from furniture you plan to refinish.

SEE ALSO

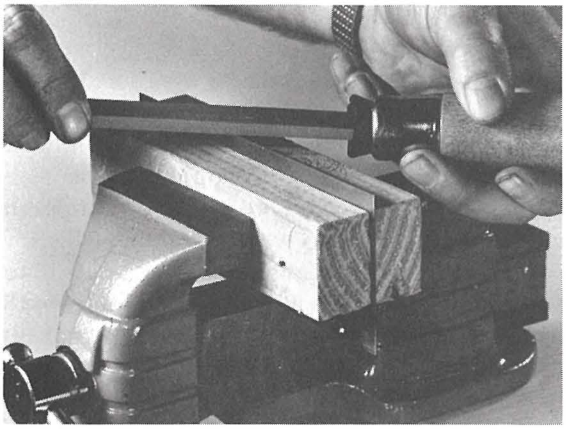
Abrasives . . . Finishes, wood . . . Sanding . . . Tools, hand . . . Wood finishes . . . Wood sculpture

The scraper itself is simply a thin spring-tempered steel blade having either a straight or curved edge. (The rectangular scraper measures 2¼x6 in.) The edge is first filed and oilstoned perfectly square. It is then "turned" with a burnisher—burnished over to form a hooked cutting edge. The burnisher, which is file-hard steel polished glass-smooth, is stroked several times with firm pressure along the square edge of the scraper at gradually increased angles until it has a turned-over sharp, even burr.

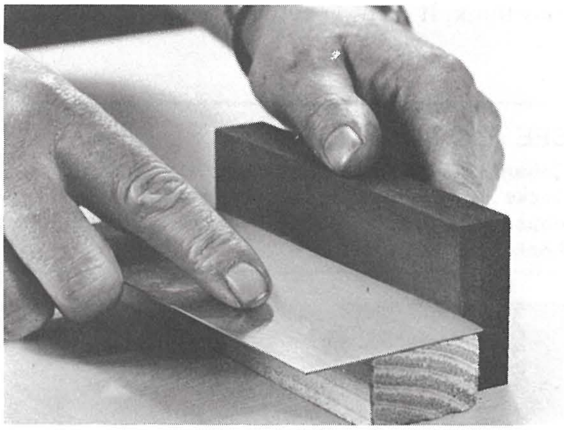
While a scraper can be pulled toward you, experienced cabinetmakers, when scraping a flat surface, ordinarily push the tool. The blade is grasped with both hands and sprung into a shallow arc with the thumbs. Then it's tilted forward until the cutting edge cuts and it is canted slightly for shearing action. Scraping with the grain of the wood leaves the smoothest finish; scraping across the grain at an angle removes wood more rapidly. The scraper's cutting edge can be re-formed with the burnisher several times before re-oilstoning is necessary.



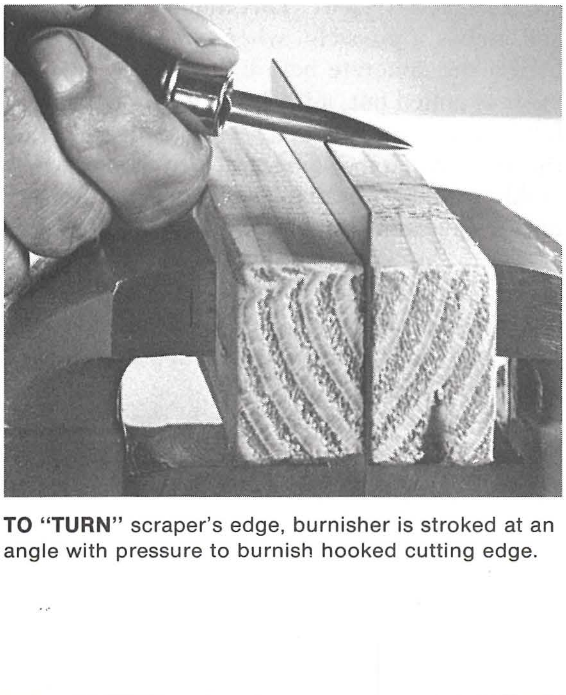
THREE CABINET SCRAPERS, plus a burnishing tool are fairly inexpensive. They can be purchased through woodworker's supply houses. Instructions for using the burnisher (far right) are usually furnished with the tools.



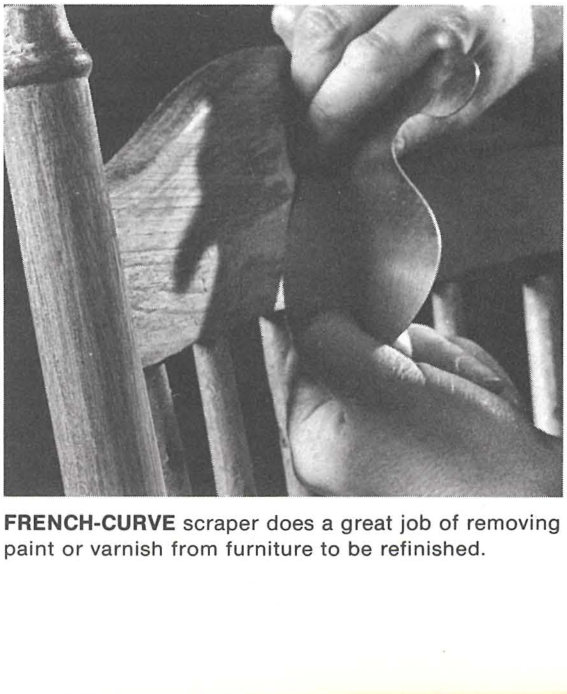
UNFINISHED EDGES of new scraper are draw-filed with a single-cut file to prepare the blade for sharpening.



TO TRUE THE edge, slide the scraper back and forth on a wood block against an oilstone set on edge.



TO "TURN" scraper's edge, burnisher is stroked at an angle with pressure to burnish hooked cutting edge.



FRENCH-CURVE scraper does a great job of removing paint or varnish from furniture to be refinished.

Add a screened porch

Adding a screened porch to your house can protect your cookouts from the bugs and rain. It also adds value to your house at resale time. Here's how to build a handsome addition to provide comfort for you and your family on those warm summer nights

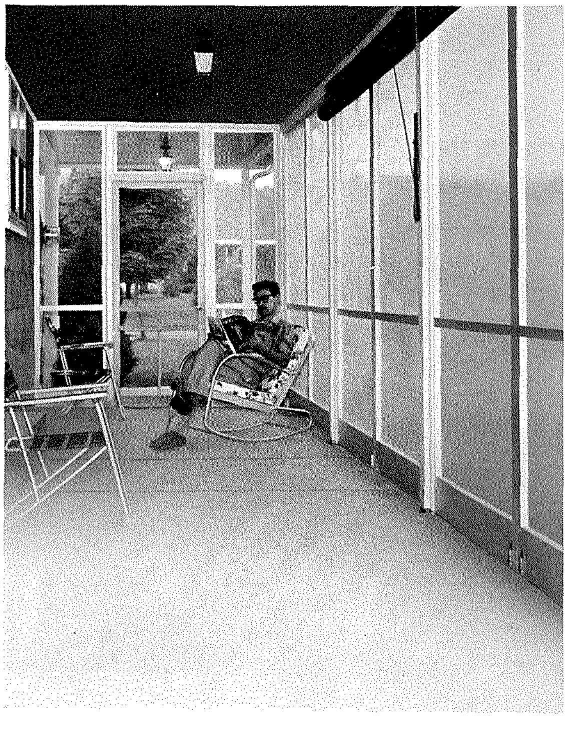
By DON SHINER

■ WHEN IT COMES to practical outdoor living, you just can't beat a screened porch. Open patios are fine when there are no bugs or sudden showers, but one or the other can ruin a cookout. When you're safe from both within the shelter of a screened porch, summer entertaining and living become twice the fun for family and guests alike.

Adding such a porch is not the major job you may think. It's a project that can be completed in stages to suit both your spare time and wallet. And even before you have it fully screened in, you'll find it usable for a cookout without worrying about getting wet.

SEE ALSO

Cabanas . . . Carpeting, outdoor . . . Concrete . . . Decks . . . Garden shelters . . . Gazebos . . . House additions . . . Lumber . . . Nails . . . Patios . . . Roofs . . . Screens



IF BUGS AND RAIN send you scurrying indoors from a cookout, it may be time to consider a screened porch.

The best spot for your porch is at the back of the house where you have the most privacy, but more important, where it will be accessible from the kitchen. If you are able to build it on the north side of the house, it will be shaded from the hot afternoon sun.

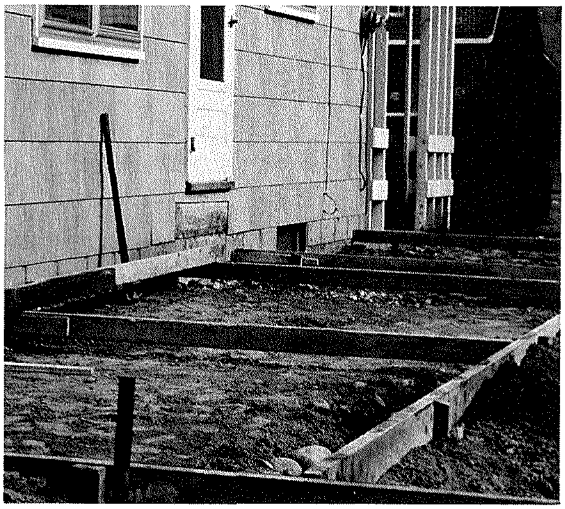
You can tackle the job in three easy stages; 1. Pouring the slab; 2. Framing the roof; 3. Adding the screens, all of which you can do yourself with help now and then from a friend. In most cases you'll be ahead if you have the slab poured. In time saved, you can have your porch completed over a two-week vacation.

If you take on the slab yourself, stake it out to suit and remove 5 or 6 in. of topsoil. Dig down 18 in. along the outer edges to form a trench to provide extra support for the roof. Erect form boards so the slab will pitch slightly away from the house (¼-in. per ft.) and are level with foundation.

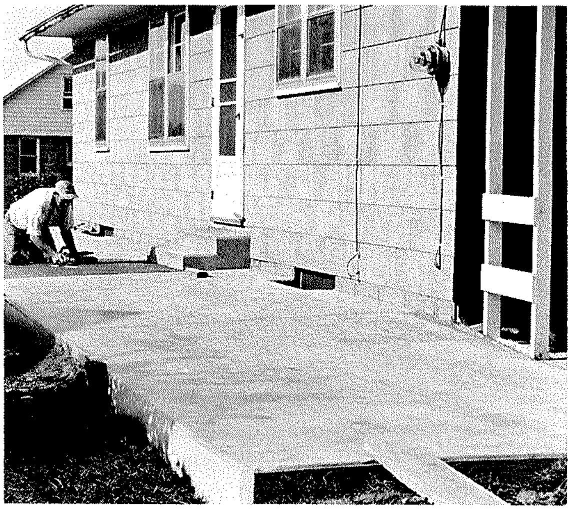
Regardless of size, it's best to pour the slab in sections, a day apart. This minimizes cracking and makes it possible, when working alone, to trowel the concrete before it sets. As each divider is pulled out, a ½x4-in. strip of expansion felt is tacked to the green section before pouring the next. When the slab is finished, cover it with building paper or burlap and keep it wet for four or five days, allowing the concrete to cure fully.

Before you start the roof, study the framing drawing. Each rafter is paired with a ceiling joist and the joists are faced on the underside with ⅜-in. plywood before a lintel, supported by 4x4 posts, is placed under it.

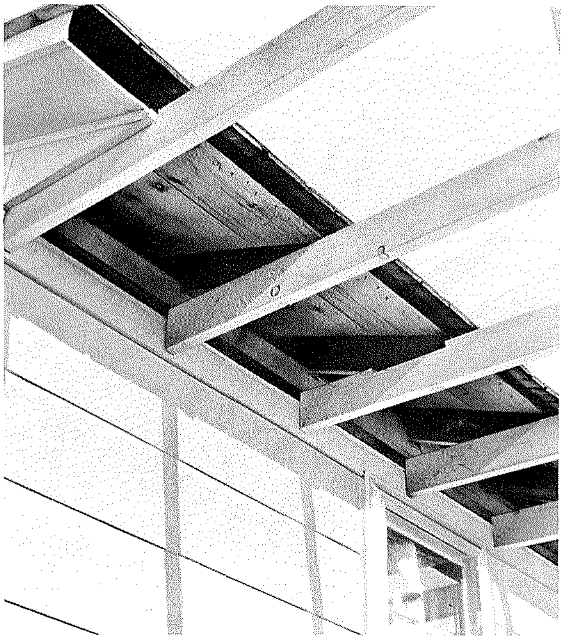
Start by spiking a 2x6 nailer to the side of the house at ceiling height. This runs the full length of the porch. Next erect a box-like frame around three sides and prop it up temporarily in a level position. Now install the ceiling joists, 24 in.



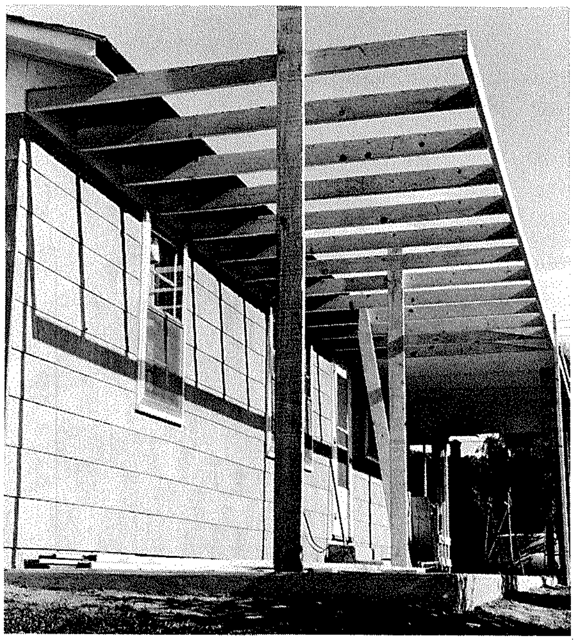
SLOPE THE FORM 2 in. to assure proper drainage. Then divide the form in sections for pouring.



AFTER EACH SECTION is poured, smooth it with a trowel, then cover it with burlap and keep it moist.



CEILING JOISTS are toenailed to a 2x6 nailer which is first nailed to the house at ceiling height.



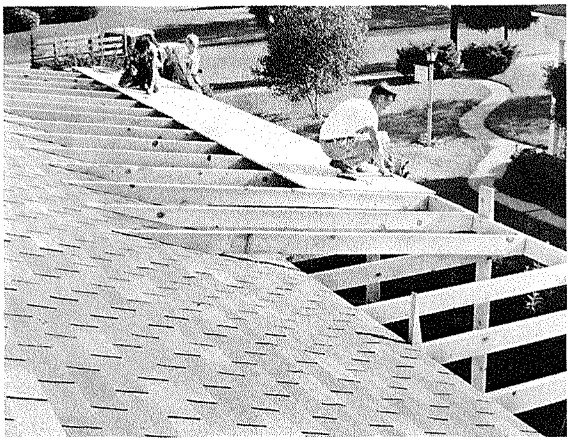
CEILING FRAMING is temporarily supported in a level position by scrap props which rest on the slab.

center to center, and toenail them to the nailer. Spike them through at the front. After this, figure how many rafters are needed (two more than joists if you double up the end ones to make a flush surface) and cut one for a pattern. Taper the end to match the pitch of the house roof. Nail rafters to the roof, right on top of the existing shingles, and spike them to the joists.

Next, you close in the framing by nailing ¾-in. plywood to the rafters and ⅜-in. plywood to the joists. Follow this by covering the roof with tar paper, then with a metal flashing where the new roof meets the old and, finally, with shingles to match the house. All that's left is to install the 4x4 lintel and its supporting 4x4 posts before filling in the ends of the porch roof and adding a 1x8 fascia board across the front and up the ends.

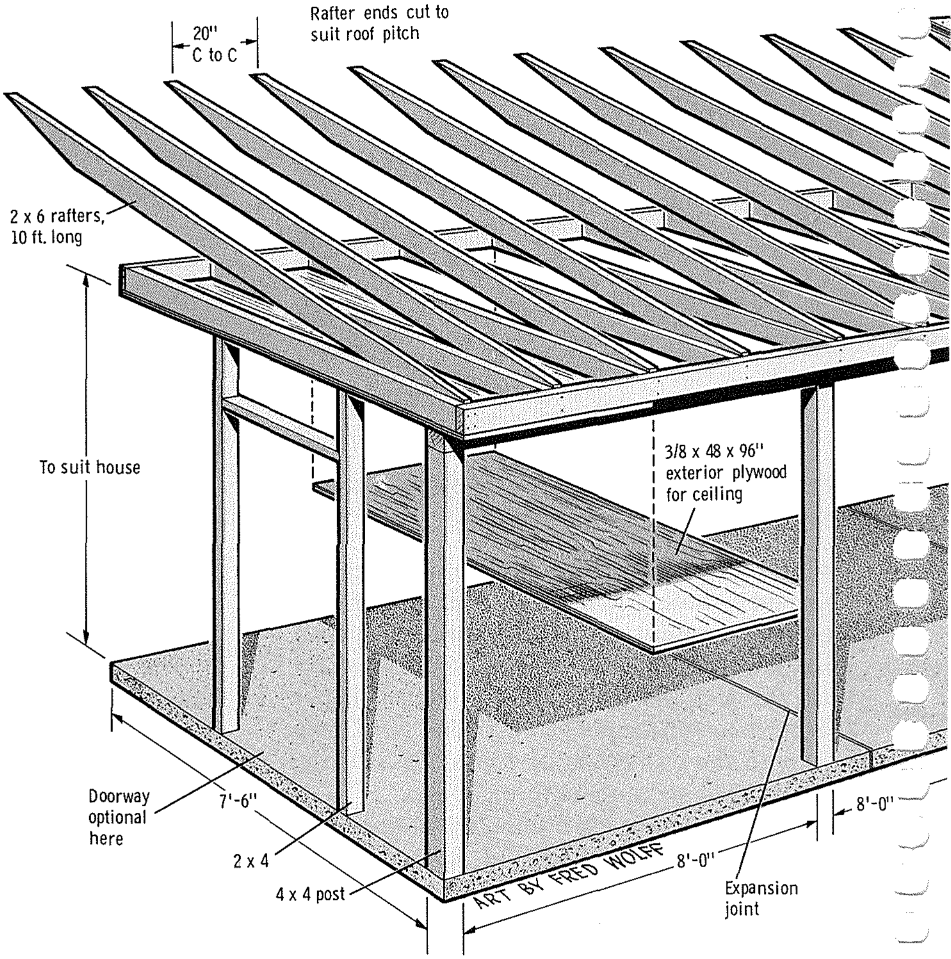
The number and size of frames you need to enclose your porch is determined from the porch itself. If you've planned for 8 ft. between posts, then all screens across the front can be made 48 in. wide. The drawing shows how the screen frames are made from common 1⅛-in. screen stock. Note how members are half-lapped for extra strength.

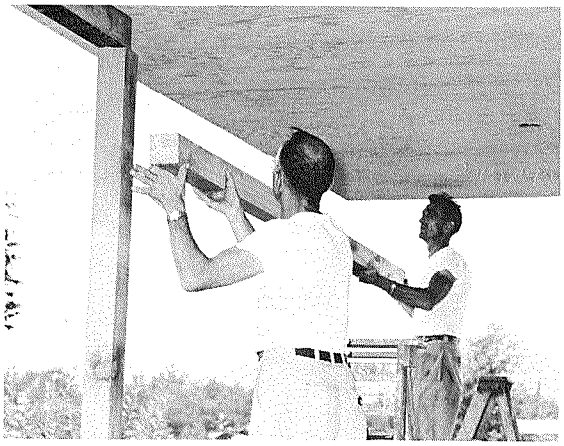
You have a choice of installing the frames permanently in place or fitting them so they can be lifted out and stored for the winter. In the



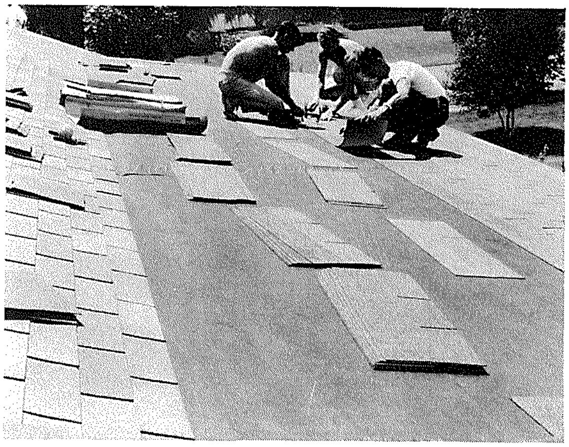
TAPERED ENDS of the rafters rest on the roof, to which they're nailed 24 in. o.c. Plywood covers rafters.

WHEN WIRING IS IN, the underside of the joists is covered with ⅜-in. plywood.



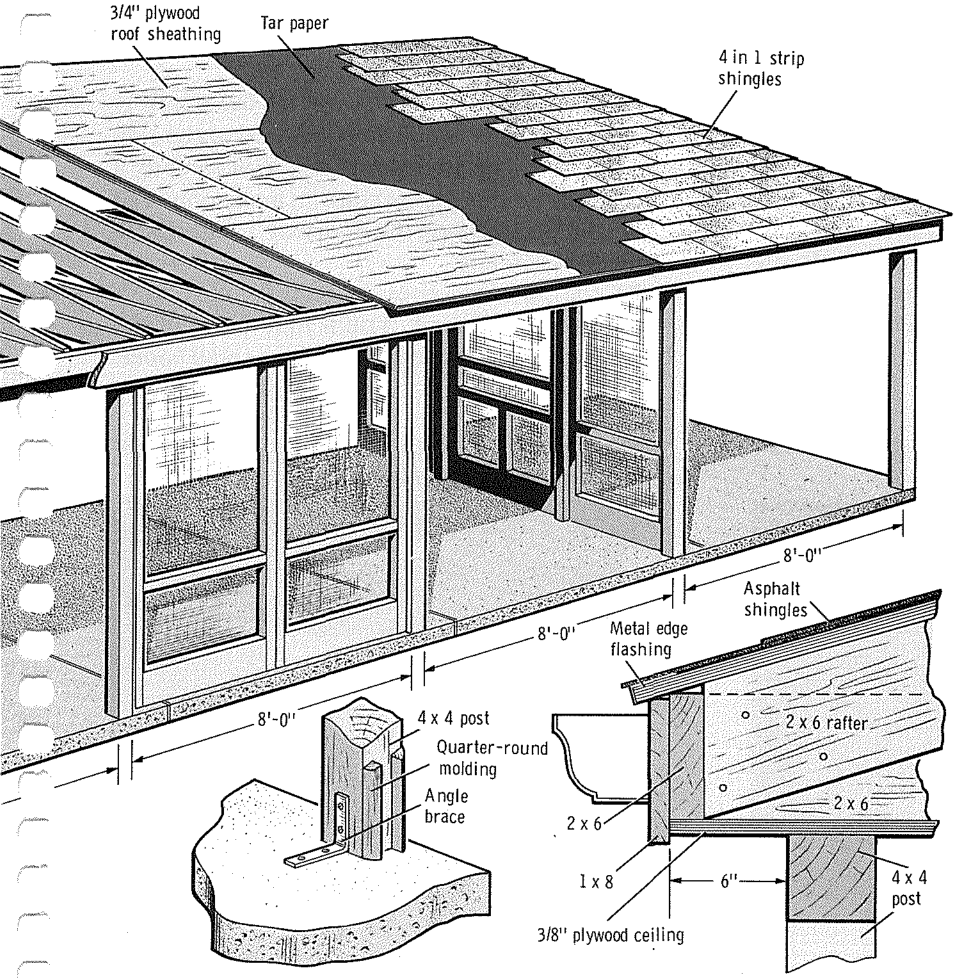


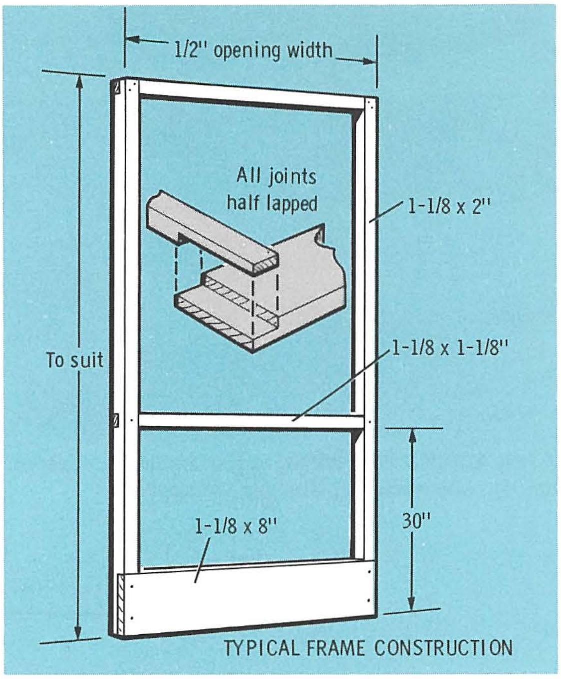
PERMANENT 4x4 posts are anchored to the slab with angle brackets, then a 4x4 lintel is placed on top.



AFTER ADDING FLASHING, roof sheathing is covered with felt, and matching shingles are applied.

please turn the page

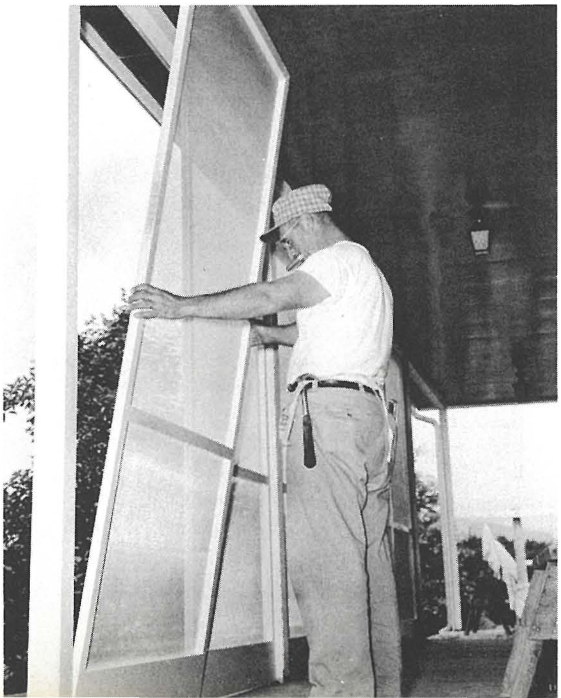




SCREEN FRAMES are built with half-lap joints for strength. Make two frames for each 8-ft. opening.

latter case, door bolts are added to the bottom rails to engage holes drilled in the slab. Quarter-round molding nailed to the posts and lintel makes the screens fit bug-tight. Drain notches should be provided along the bottoms of the screens, and if screens are permanently installed, pick copper wire or aluminum, or one of the new plastic screening materials, to cover them.

QUARTER-ROUND MOLDING, tacked to posts and lintel, provides neat rabbets in which screens rest.



SLIDING-DOOR BOLTS lock screens to the slab. Use a masonry bit to drill holes in the slab.

The door opening in the end of the porch is framed with 2x4s which are anchored to the slab and the joist with angle brackets. You can buy a stock door as cheaply as you can make one. The area which surrounds the doorway is fitted with individual screens.

As the summer goes by you'll enjoy your porch more and more. You'll find it one of the best investments you can make for a small home.

THE DOORWAY is framed in the end with 2x4s for a stock door. Openings around the door are screened.

Fireplace reflector

I have gas logs in my fireplace and with the higher cost of heating, I'm thinking of installing a sheet-aluminum reflector back of the logs. Is this practical? Will it reflect more heat into the room?—H. Oakes, Lincoln, Neb.

If your fireplace is a conventional masonry type, it is lined with firebrick, which in itself is reflective. For this backing to be effective, it must be free of soot from burning wood or coal. Soot usually can be removed with a scrub brush and a strong detergent solution. If the backing is kept clean, there should be no need for a metal lining—but you may wish to experiment. To be effective, the metal must be kept clean and bright, and if you're ever going to use it with ordinary logs, it should be fitted so that you won't have to worry about it falling over when burning logs roll. For units you can buy to get more heat from your fireplace, see *Fireplace Heat Savers,* page 174, Dec. '74 *PM.*

No match

Recently I filled small holes in a latex-painted wall. I used the same paint as that used originally, but the spot-painting is of slightly different color and it's glossy, not flat. Why is this, and how do I correct it without repainting the entire wall?—Barney Gill, Boston.

It sounds as though you didn't seal the patches. The proper procedure is to sand the filled area, dust and apply a coat of shellac; then rub lightly with steel wool, dust again and apply the paint—which must be stirred thoroughly.

Leveling chair

I have an older chair that won't sit level—stable—on the floor. All four legs are turnings of such a design that I can't cut off the lower ends without altering the shape. Is there any other way to stabilize this chair?—Tom Smith, New Orleans.

Place the chair on a surface you know is level and determine how much is to be cut off to stabilize the chair. If this is only a fraction of an inch, say ¼ in., this much might be removed without altering the turning.

If more than this amount must be removed, then you might resort to a leg leveler, or glide. This gadget is fitted tightly into a hole drilled in the lower end of the short leg; when in place it permits adjustment of the length of the leg until the chair sits without any wobble on a level surface. When installing the leveler, be sure the hole is drilled concentrically.

Objectionable house odor

Recently I bought an old home of 11 rooms, and I've done as complete a renovating job as I know how to do. But still, objectionable odors are permeating the whole place. Do you have any suggestion?—John Rusman, Palisades Park, N.J.

If this house has been closed, unlived-in and unventilated for a relatively long time, the conditions that develop over such a period of time were ideally favorable for the growth of mildew, whence comes the persistent musty odor. Perhaps the only practical further step is to scrub everything scrubbable with a strong solution of trisodium phosphate (*caution:* wear rubber gloves and eye protection), then paint everything paintable—walls, ceilings and woodwork—with aluminum paint, followed by a primer and a finish coat. If the carpeting is old, discard it and lay new material.

Insurer's imprint

I have an oval-shaped object of lead or other soft metal and about 3 inches long. It's somewhat damaged, but what appears to be the imprint of a fireman is on one face, plus traces of red and white enamel. From this description, can you tell me what this object might be and what it was used for?—A.O., R.I.

I'm guessing it's what was known as a "fire mark," which used to be provided by an insurer for an owner to attach to his house in a conspicuous place. Its purpose was to alert local fireman and others in the event of a fire that the home was insured and assure them that they would be paid for their smoke-eating efforts.

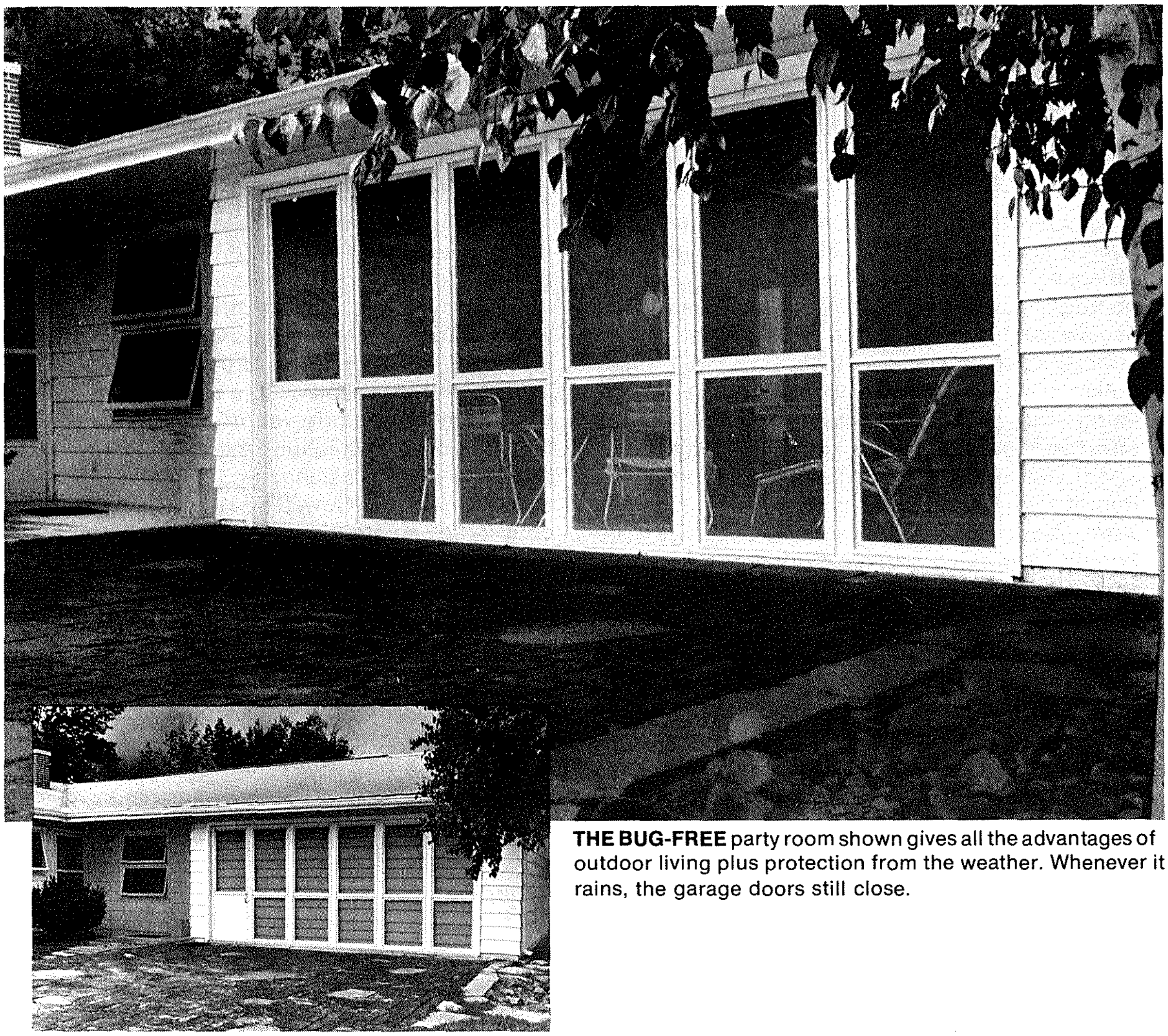
If genuine, such an imprint might have some value as an antique.

Blistered tile floor

There are two blisters in my asphalt-tile basement floor. These are at the point where the corners of four tiles meet, the raised portions being only about ⅜ in. high and perhaps 2 in. in diameter. When pressed down, they spring up again. How can I remedy this?—D.F., Utah.

First, I'd dampen a washcloth, fold it double, place it over a blister and hold a household iron on the cloth while the iron's switch is set at the silk setting. The trick is to apply just the right degree of heat—and no more—to soften the cement. Then lift the iron and cloth, and place a weighted block over the blister. If this doesn't do the trick, remove the tile and old mastic and apply new adhesive.

by W. Clyde Lammey



THE BUG-FREE party room shown gives all the advantages of outdoor living plus protection from the weather. Whenever it rains, the garage doors still close.

Your garage can be a screened porch

By CRAIG WILSON

▨ A QUICK, inexpensive way to gain a closed-in patio is simply to screen an existing garage. Though an attached garage is more desirable for this improvement, there's no reason why the idea can not be adapted to a detached one. Either way, you will gain by giving those noisy, sometimes clutter-prone, bored youngsters a place to play on a rainy day or creating a spot for Mom and Dad to get away from it all.

Since my garage has a 15-ft.- wide door opening, I laid out the screened wall in six panels, including the convenience door at one end. And, because my wife and I don't particularly care for airconditioning, I installed a 24-in. fan in the wall between the house and garage. Thus, the screened opening is ample for drawing cool, evening breezes into our home.

SEE ALSO

Garage doors . . . Garage remodeling . . .
Garage-patios . . . Garden shelters . . . Gazebos . . .
House additions . . . Patios . . . Screens

Before starting the project, make certain that the garage-door handle projects no farther than the garage-door stops. Then lay the sole plate along the garage-door opening and line it up with the stops on the *inside*. This is fastened with flat-head wood screws into lead anchors dropped into the concrete. When you disassemble the setup, the plugs can be filled with corks to prevent them from becoming clogged with dirt.

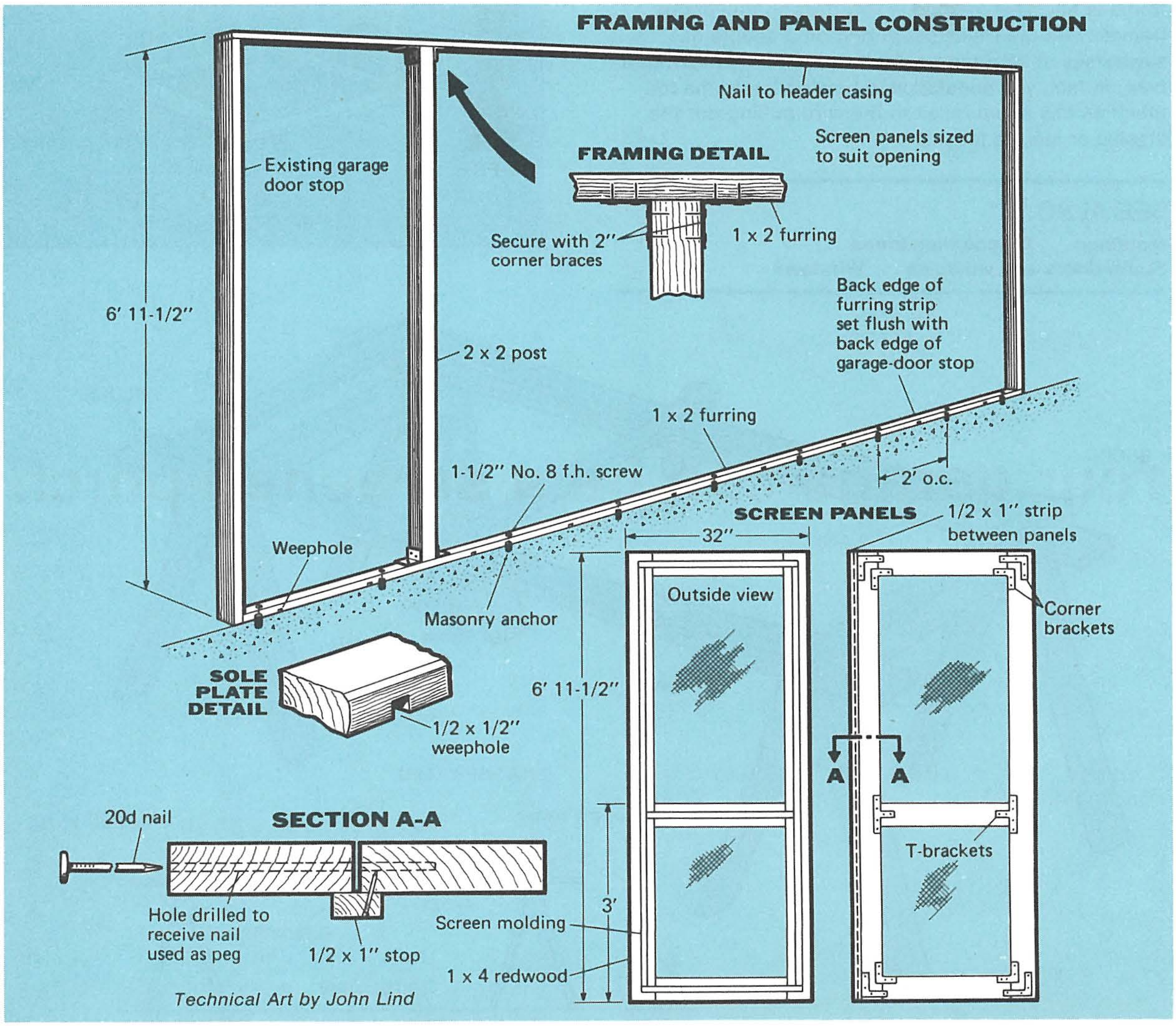
Divide your garage opening into panels 30 to 40 in. wide for best-looking results. The entrance door is optional but we have found that it was well worth the small amount of extra effort that building it required. For rigidity, I used a 2x2 as the door post (on the hinged side), fastening it at top and bottom with L-shaped brackets and screws.

For the usual reasons—weather and termite-resistant qualities—I used redwood throughout. The redwood can be stained natural or painted to suit your preference.

Caution: Since there's a more than even chance that your garage finished opening may be out of plumb or not level, trim and fit the individual screens to their exact position in sequence. Link each screen to its neighbor as shown in the drawings, and, to save yourself some frustration next spring when putting them back up, number the screens for easy identification and quick placement.

If you decide to paint your screens, the finished job will look a lot neater if you do all the carpentry first, including temporary assembly. Then, take them down, prime and paint the wood and fasten the wire screening.

For wrinkle-free screens, use the time-tested method of shimming both ends and clamping the middle before stapling the screening to the framework. To finish, cover the staples with conventional screen molding.


FRAMING AND PANEL CONSTRUCTION

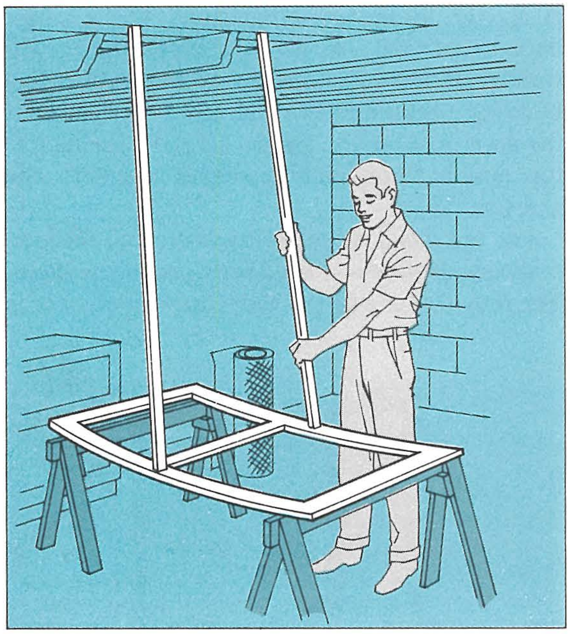
Technical Art by John Lind

How to stretch screen wire

Play it smart; let frame do stretching

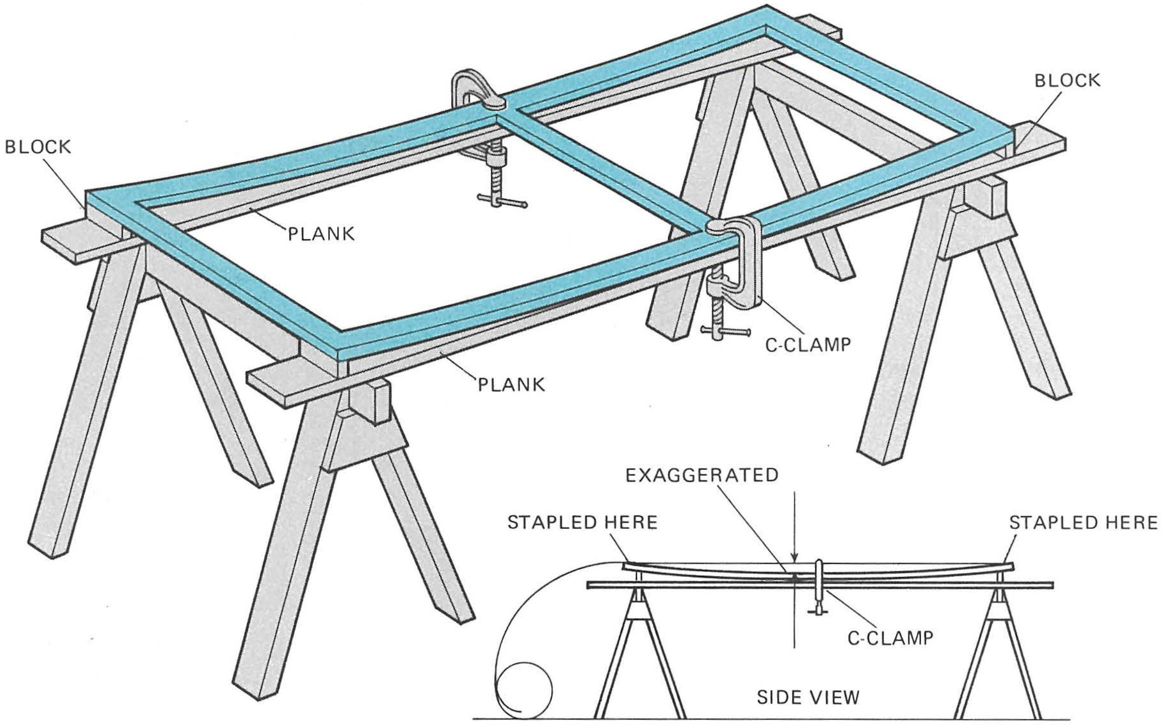
Ripping the old wire from wooden frames and stapling on the new is simple enough—it's the stretching that's the tricky part. Trying to get it smooth and taut by hand not only is hard on the fingers but invariably results in a belly in the wire, no matter how you tug and pull.

Actually, it's not that hard a job. If you play it smart, the frame itself can be used to do the stretching. Bowing the frame slightly is the most common method. This can be done with a couple of jack sticks, as at right, or with blocks and C-clamps, as shown below. After the wire is stapled to each end and the bow relieved, the frame will straighten out and stretch the wire as taut as a drumhead. The stapling is completed along each side while the frame is flat. This method works best on full-length frames, with the frame supported on a couple of sawhorses or wooden boxes. It doesn't take much of a bow; in fact, you should avoid bowing the frame too much as this could result in the wire pulling out the staples or tearing loose.

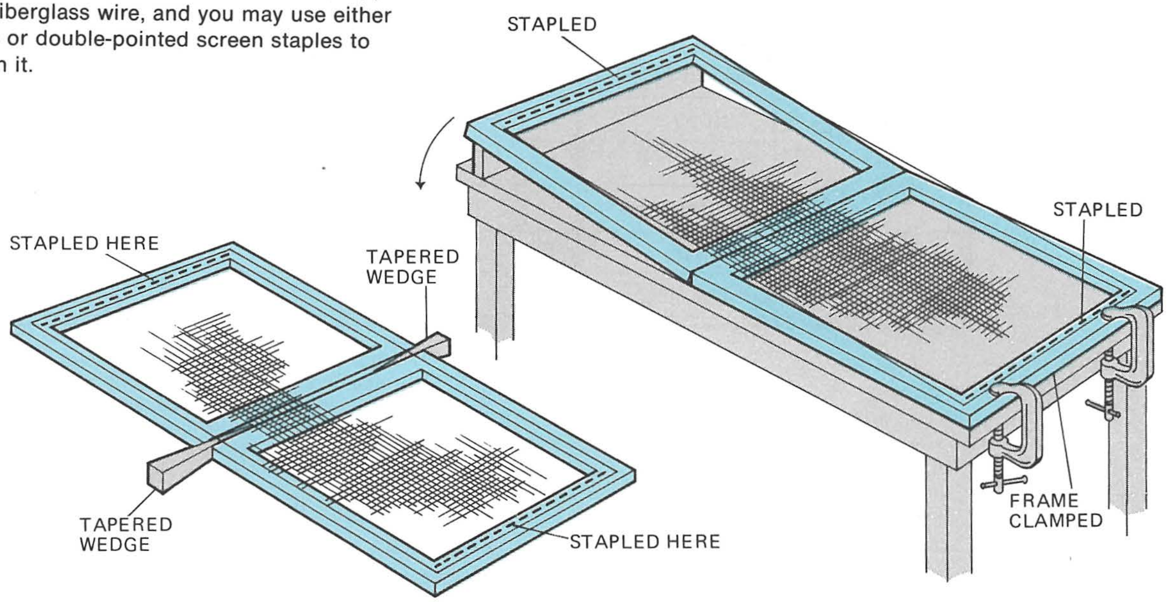


SEE ALSO

Moldings . . . Remodeling ideas . . .
Storm doors and windows . . . Windows

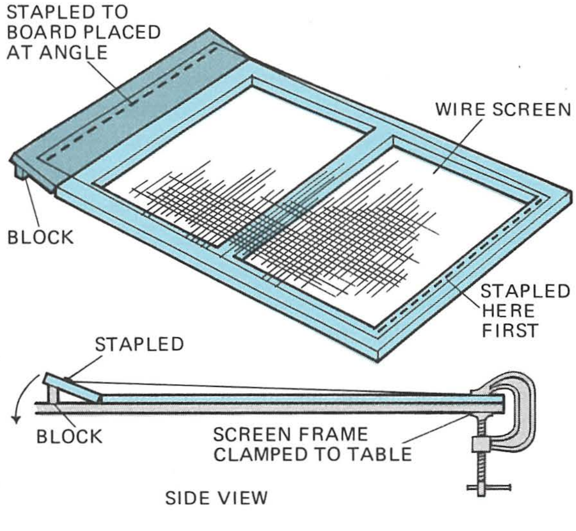


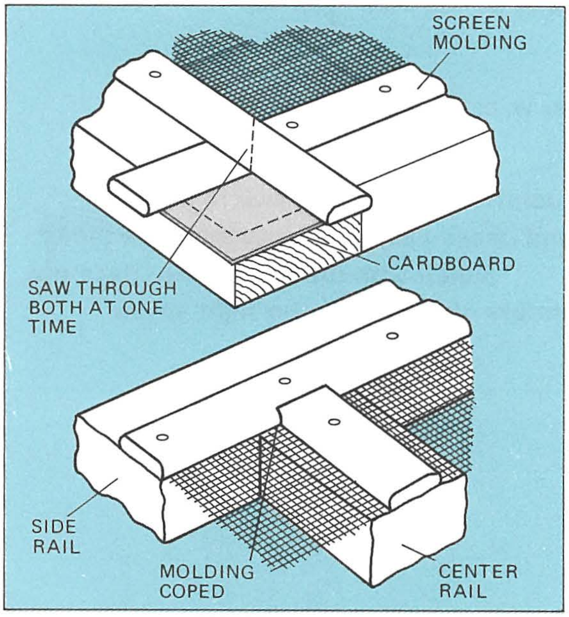
SCREEN WIRE is available in standard widths of 24, 26, 28, 30, 32, 36 and 42 inches. You have a choice of galvanized, aluminum, copper and fiberglass wire, and you may use either tacks or double-pointed screen staples to fasten it.



Small frames stretch each other

Small screens can be used to stretch the wire by covering two at a time (above). Frames are flat on a floor or table with one elevated a bit. In each case, they are butted and the wire stapled to the outer ends only. In method A, the wire is stretched by removing the block; in method B, it's done by forcing the frames apart with tapered wedges. Shown below is still another way for stretching wire on a full-length frame.


STAPLED TO BOARD PLACED AT ANGLE
WIRE SCREEN
BLOCK
STAPLED HERE FIRST
STAPLED
BLOCK
SCREEN FRAME CLAMPED TO TABLE
SIDE VIEW



Slick molding trick

If you don't own a miterbox, you can do without one when mitering screen molding. Simply let one strip lap the other (above), then saw through both strips at a 45° angle at one time. Cardboard will protect frame from saw marks. Center-rail molding is coped to mate with side moldings.

Gauge Numbers			0	1	2	3	4	5	6
Actual Cross Section of Screws			●	●	●	●	●	●	●
Basic Decimal Diameter			.060	.073	.086	.099	.112	.125	.138
Fractional Dia. Nearest 64th			1/16−	5/64−	5/64+	3/32+	7/64+	1/8−	9/64−
Drill Number			52	47	42	37	32	30	27
Pilot or Anchor-Hole Sizes	Hardwood	Slotted Screws	70	66	56	54	52	49	47
		Phillips "			70	66	56	54	52
	Softwood	Slotted "	75	71	65	58	55	53	52
		Phillips "			75	71	65	58	55
Threads Per Inch			32	28	26	24	22	20	18
Maximum Head Diameter			.119	.146	.172	.199	.225	.252	.279

Drill sizes for body clearance holes are given in either numbered or lettered drill sizes. Dimensions are given in decimal or fractional parts of inches. In general, pilot holes should be about 90 per cent of screw-core sizes for hardwood, 70 per cent for softwood. In end grain and also in softwoods, such as

Choose the right screw for the job

By W. CLYDE LAMMEY

Joints made with screws resist pull, shear and shock very nearly as much as those joined with the best glues. Here are pointers on selecting the right screw

A WOOD SCREW HAS FAR greater holding power than a nail in either hard or softwood. A project joined with nails only can be racked out of shape or the joinery pried apart by judicious use of hammer claws or a pry-bar. But not so with screws; you have to back them out one by one with a screwdriver in order to disassemble the joints without damage.

A screw cuts its own threads in wood when turned into a counterbore of the proper size. As the screw is driven, the raised threads force the wood fibers apart, and the advance of the threads draws the parts being joined tightly together when the screwhead is finally seated. Once seated, a screw won't shake loose and it won't let go.

Most wood screws are made of steel, but screws also are available in brass, bronze and aluminum. Steel screws also come plated with brass, zinc, cadmium and chromium to resist rust and make them more attractive to the eye when used in exposed locations. Screws with flat heads are perhaps the most commonly used, but wood screws also are available in all ordinary sizes with oval, round, fillister and square heads, the latter supplied as lagscrews and as special screws for attaching ornamental hinges and latches. On some of these the heads are not only square, but they also are slotted so that they may be installed with a screwdriver. On lagscrews you have to use a wrench, as the head is square but not slotted.

Sizes (the shank diameters) are designated by

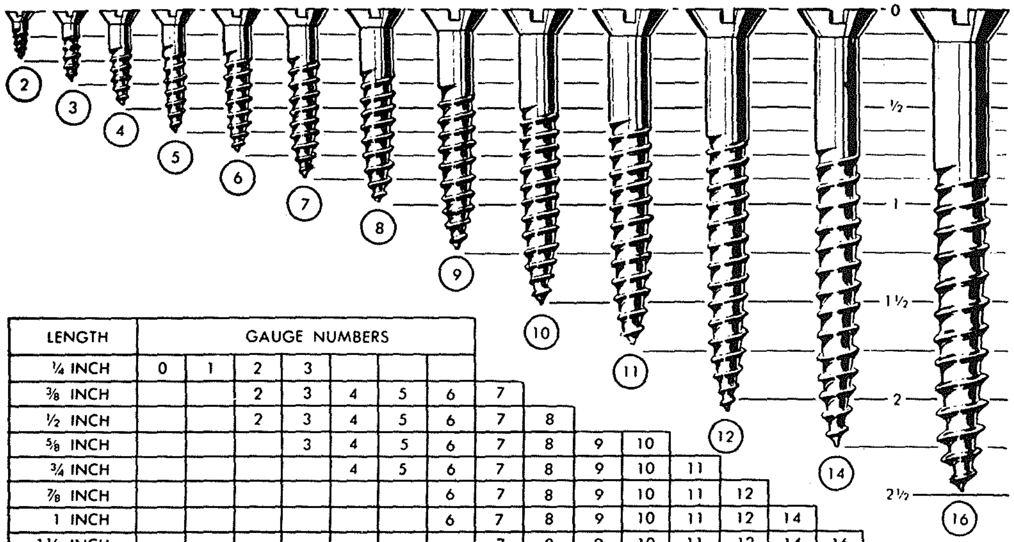
SEE ALSO
Bolts . . . Fasteners . . . Hinges . . . Nails . . . Riveting . . . Staple guns . . . Threading

7	8	9	10	11	12	14	16	18	20	24
●	●	●	●	●	●	●	●	●	●	●
.151	.164	.177	.190	.203	.216	.242	.268	.294	.320	.372
5/32−	5/32+	11/64+	3/16+	13/64−	7/32−	15/64+	17/64+	19/64−	21/64−	3/8
22	18	14	10	4	2	D	I	N	P	V
44	40	37	33	31	30	25	18	13	4	1
49	47	44	40	37	33	31	30	25	18	13
51	48	45	43	40	38	32	29	26	19	15
53	52	51	48	45	43	40	38	32	29	26
16	15	14	13	12	11	10	9	8	8	7
.305	.332	.358	.385	.411	.438	.491	.544	.597	.650	.756

pine, it frequently is unnecessary to drill a pilot hole.

There are nearly 300 standard screws of various sizes, lengths and types. Regular screws have gimlet points; cone and diamond points are special. Length is measured from the threaded tip to the largest bearing surface of the head. Body diameters—gauge sizes—increase in steps of .013 in. Tolerance from specified sizes ranges from .004 in. plus to .007 in. minus. A 10-per-cent variation in threads per inch is permitted. Head dimensions of wood screws are identical to those of machine screws of the same size and type.

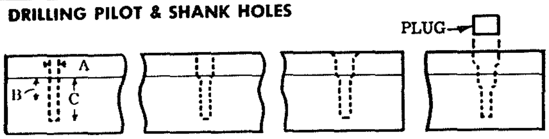
WOOD SCREWS



LENGTH	GAUGE NUMBERS																
¼ INCH	0	1	2	3													
⅜ INCH			2	3	4	5	6	7									
½ INCH			2	3	4	5	6	7	8								
⅝ INCH				3	4	5	6	7	8	9	10						
¾ INCH					4	5	6	7	8	9	10	11					
⅞ INCH							6	7	8	9	10	11	12				
1 INCH							6	7	8	9	10	11	12	14			
1¼ INCH								7	8	9	10	11	12	14	16		
1½ INCH							6	7	8	9	10	11	12	14	16	18	
1¾ INCH									8	9	10	11	12	14	16	18	20
2 INCH									8	9	10	11	12	14	16	18	20
2¼ INCH										9	10	11	12	14	16	18	20
2½ INCH													12	14	16	18	20
2¾ INCH														14	16	18	20
3 INCH															16	18	20
3½ INCH																18	20	24
4 INCH																18	20	24

WHEN YOU BUY SCREWS, SPECIFY (1) LENGTH, (2) GAUGE NUMBER, (3) TYPE OF HEAD–FLAT ROUND OR OVAL, (4) MATERIAL–STEEL, BRASS BRONZE, ETC., (5) FINISH–BRIGHT STEEL BLUED CADMIUM NICKEL OR CHROMIUM PLATED

DRILLING PILOT & SHANK HOLES



A, pilot hole. B, thread depth for softwood. C, thread depth for hardwood

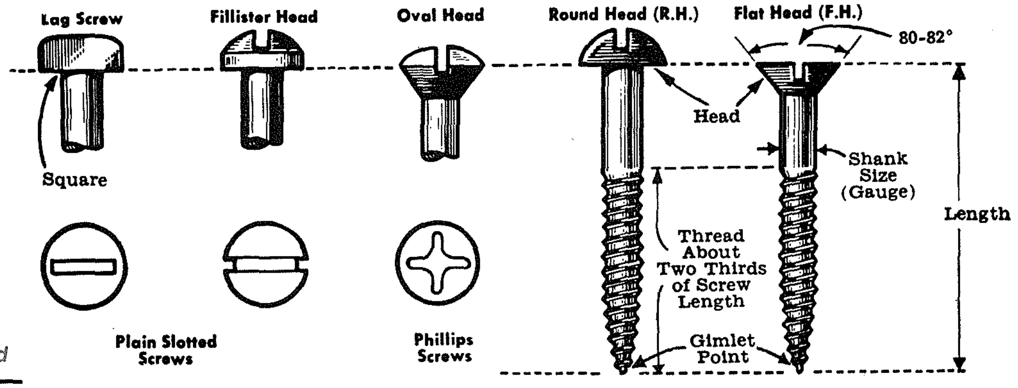
Shank hole equal in dia. and length of screw shank

Countersink so flat-head screws will be flush

Counterbore for plug first with auger bit but last with twist drill

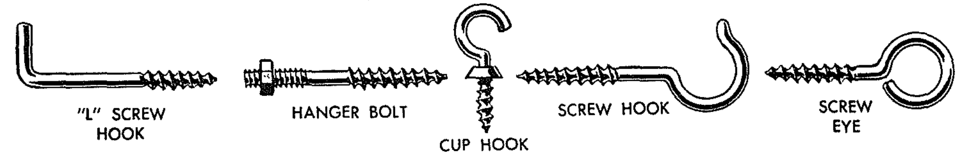
LAG SCREWS — LENGTHS AND DIAMETERS (in inches)

Lengths		Diameters		
	¼	⅜, 7/16, ½	⅝, ¾	⅞, 1
1	x	x		
1½	x	x	x	
2, 2½, etc., to 10	x	x	x	x
11 & 12		x	x	x
13 to 16			x	x



choosing screws, continued

OTHER SCREW APPLICATIONS



GENERALLY AVAILABLE IN SEVERAL SIZES AND METALS

numbers. Only sizes (numbers) 2 through 16 are detailed. The sizes go up with the numbers and only the average sizes in common use are shown.

Slots in screwheads are of three common types: those slotted all the way across the head; another in which a stopped slot is milled into the head; and a third having the head recessed or cross-slotted to take the tip of the special Phillips screwdriver.

Lengths of common screws usually are in inches and even fractions of an inch as 1, 1¼, 1½ and so on. Those having a length of less than 1 in. also come in eighths as ⅜ in., ⅝ in. and so on.

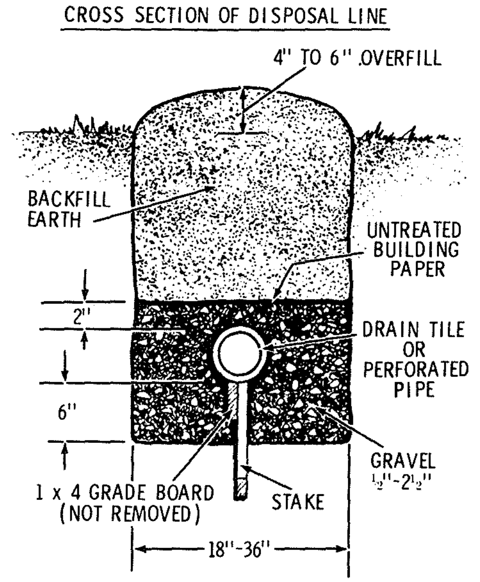
When turning in screws it's important to use a screwdriver of the correct size. If the blade tip is too small it may twist out of the slot; if too large it may slip out of the slot or damage the wood when you seat a flathead screw. When seating a flathead screw, select a blade having a width slightly less than the full width of the slot in the screwhead. The blade should fit the slot snugly with a minimum of side play. Otherwise it may slip out when you apply torque, and damage the wood, the slot or both.

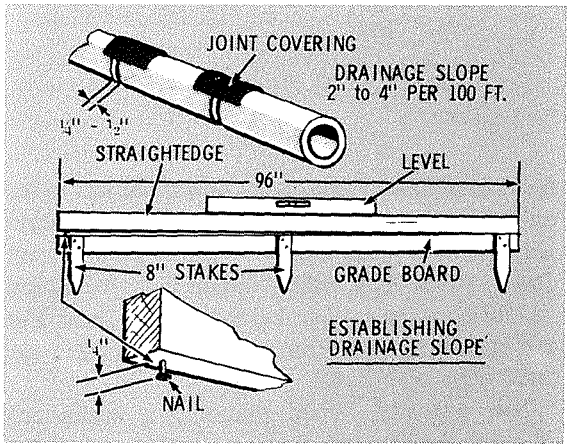
The size of the screw hole also is important. The wood must be counterbored and countersunk if you're using flathead screws. The first portion of the counterbore must be just large enough (see the tables) to take the shank, and the second portion should be of a diameter and depth to take the threaded section, the diameter being measured at the bottom of the threads. In softwoods and end grain, the depth of the counterbore is stopped a little short of the full length of the screw. In hardwoods the counterbore should normally be the full length.

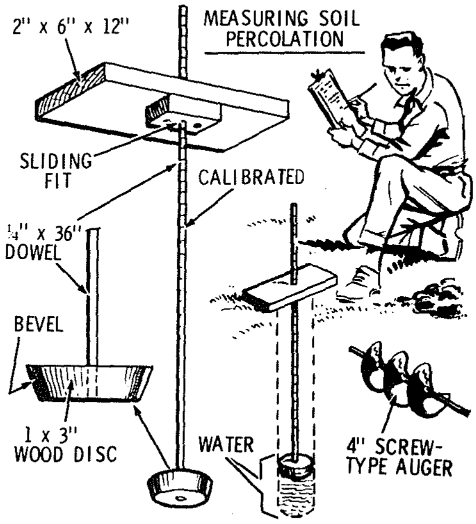
Ideally, the length of the screw used should be such that the full thread is turned into the stationary piece of the assembly, with the shank in the piece being attached. Put another way, the length of the smaller hole should equal the thickness of the stationary piece, and the larger should equal the depth of the piece being joined to it. Of course this ratio isn't always possible, but the common rule is to approach it as nearly as possible in any joinery which is to be made with screws. This position of the screw in the parts being joined normally gives the maximum holding power.

Have a trouble-free septic system

Knowing how the system operates, how and why its design is determined, aren't difficult. But they're the first steps in keeping it running well


CROSS SECTION OF DISPOSAL LINE
4" TO 6" OVERFILL
BACKFILL EARTH
UNTREATED BUILDING PAPER
2"
DRAIN TILE OR PERFORATED PIPE
6"
GRAVEL ½"-2½"
1 x 4 GRADE BOARD (NOT REMOVED)
STAKE
18"-36"





▩ TROUBLE-FREE OPERATION of a septic-tank disposal system depends, first of all, on good design, adequate size and proper installation. Of equal importance is the volume of waste discharged into the system, and how often the tank is inspected and emptied.

Most communities require strict compliance with local ordinances in granting a permit for a disposal system and approving its installation. Therefore, when planning one, first acquaint yourself fully with local regulations.

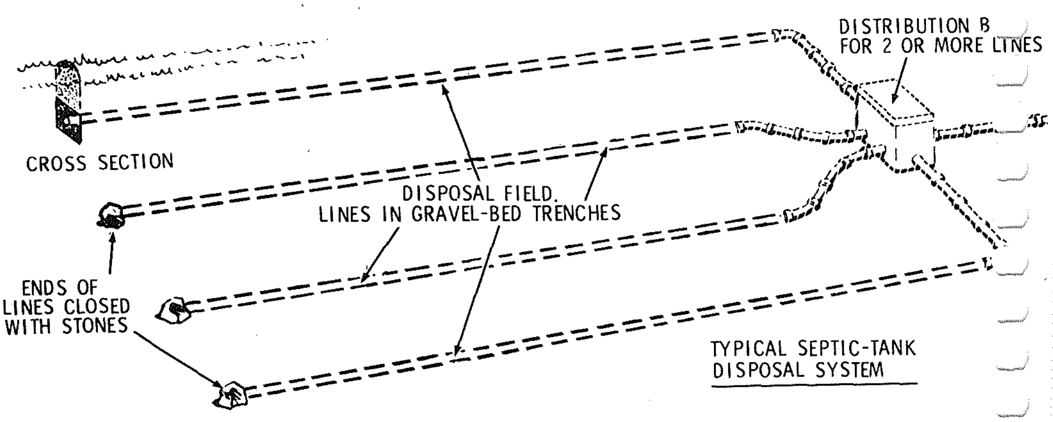
How system works. In a typical septic-tank disposal system, waste entering the tank decomposes in liquid that normally fills the tank up to the outlet. Part of the waste settles to the bottom forming sludge, and part of it floats on the liquid forming scum. Only the clear liquid, called "effluent," should pass through the outlet. The purpose of a septic tank is to condition the effluent for absorption in the soil. When sewage enters the tank, an equal volume of the effluent passes into the disposal lines to soak into the earth within about 36 in. from the surface. Disease-producing bacteria in the effluent are eliminated here.

Location requirements. The septic tank and disposal field must be located at safe distances

SEE ALSO

Bathrooms . . . Bathtubs . . . Drains . . . Faucets . . . Garbage disposers . . . Plumbing . . . Toilets . . . Well driving

septic system, continued



TYPICAL SEPTIC-TANK DISPOSAL SYSTEM

TABLE A
RECOMMENDED SIZE OF DISPOSAL-FIELD TRENCHES

PERCOLATION RATE — (MIN. WATER FALLS 1")	LINEAL FEET OF TRENCH PER BEDROOM			
	WIDTH 18" DEPTH 19"-30"	WIDTH 24" DEPTH 19"-30"	WIDTH 30" DEPTH 19"-30"	WIDTH 36" DEPTH 24"-36"
2 OR LESS	57	43	34	28
3	67	50	40	33
4	77	58	46	38
5	84	63	50	42
10	110	83	66	55
15	127	95	76	63
30	167	125	100	83
60	220	165	132	110

OVER 60—NOT SUITABLE FOR DISPOSAL TRENCHES.
NOTE—MINIMUM TRENCH LENGTH IS FOR 2 BEDROOMS.

TABLE B
DISTANCE BETWEEN TRENCHES

TRENCH WIDTH	FEET DISTANCE BETWEEN CENTERLINES
12" TO 18"	6'
18" TO 24"	6½'
24" TO 30"	7'
30" TO 36"	7½'

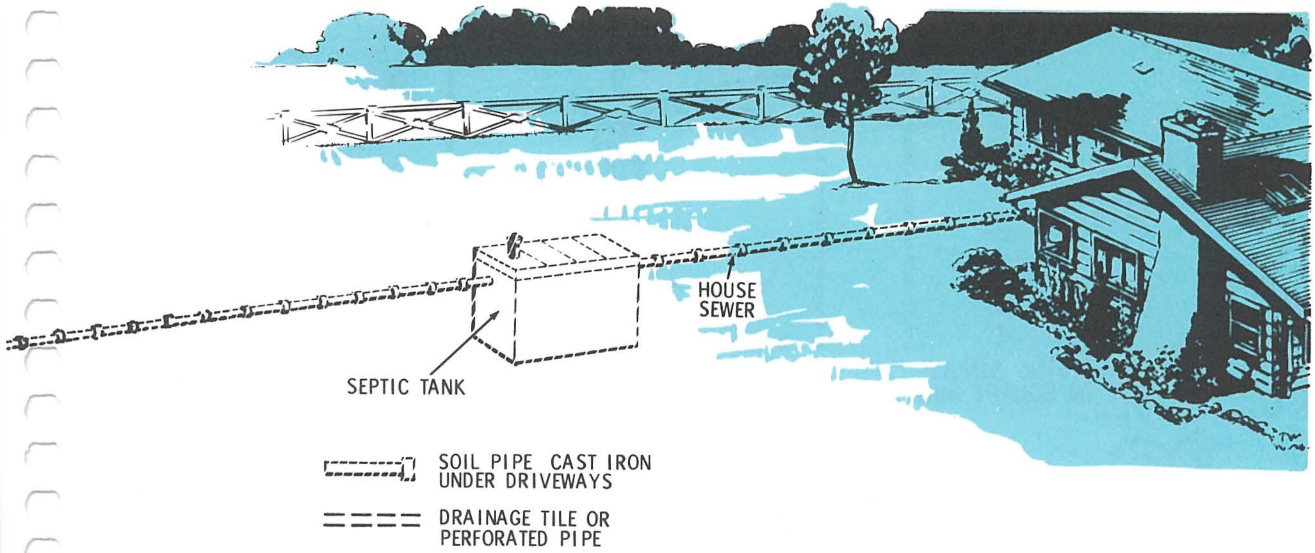
from sources of water supply. In general, the distance should not be less than 50 ft. for the septic tank and 100 ft. for the disposal field. Both should be on the downhill side of the water supply source, since ground pollution moves in the same direction as ground water.

A septic tank should be at least 5 ft. from any building. The disposal field should be located in an open area at least 10 ft. from buildings; about 15 ft. from property lines; about the same from trees and dense shrubbery (to avoid root troubles); and 25 ft. from streams or lakes.

Neither septic tank nor disposal field should be located in a swampy area or one subject to frequent flooding. The maximum height of ground water should be at least 4 ft. below ground level. Rock strata and other impervious formations should be at least 4½ ft. below disposal lines. You can check for all of this with a 2-in. earth auger fitted with extensions.

Soil porosity. When planning a septic-tank disposal system, the first thing to do is to test soil porosity. Use a 4-in. soil auger to make 6 or 8 holes about as deep as the disposal trenches are to be, space them uniformly over the selected site. Scrape the sides and bottoms of the holes with a knife to eliminate smeared surfaces and remove loose earth. Place a 2-in. layer of gravel or coarse sand on the bottom.

Keep the holes filled with water overnight and make percolation tests 24 hrs. after water was first put into the holes. (The percolation rate is the time required for water to drop 1 in.) If water is still present, adjust its depth to 6 in. and measure the drop in level over 30-min. periods, using the last check to figure the percolation rate. If there is no water in the hole, fill it to a 6-in. depth and measure the drop at 30-min. intervals over a period of 4 hrs., refilling as necessary and using the last check. In soils where the first 6 in. of water seeps away in less than 30 min., measure the drop every 10 min. over a period of 1 hr. and use the last check. Refer to Table A for the needed length of the disposal field per bedroom


HOUSE SEWER
SEPTIC TANK
SOIL PIPE CAST IRON UNDER DRIVEWAYS
DRAINAGE TILE OR PERFORATED PIPE

in the dwelling it is to serve. If the soil has a percolation rate slower than 1 in. in 60 min., it is not suitable for a disposal field. In such cases the local health authority should be consulted for recommendations.

Disposal field. Most disposal fields consist of trenches in which drain tile or perforated, nonmetallic pipe is laid in gravel. Only this type of disposal area will be discussed here. Trenches should not be less than 18 in. nor more than 36 in. in either depth or width. The depth is influenced by septic-tank outlet and ground slope.

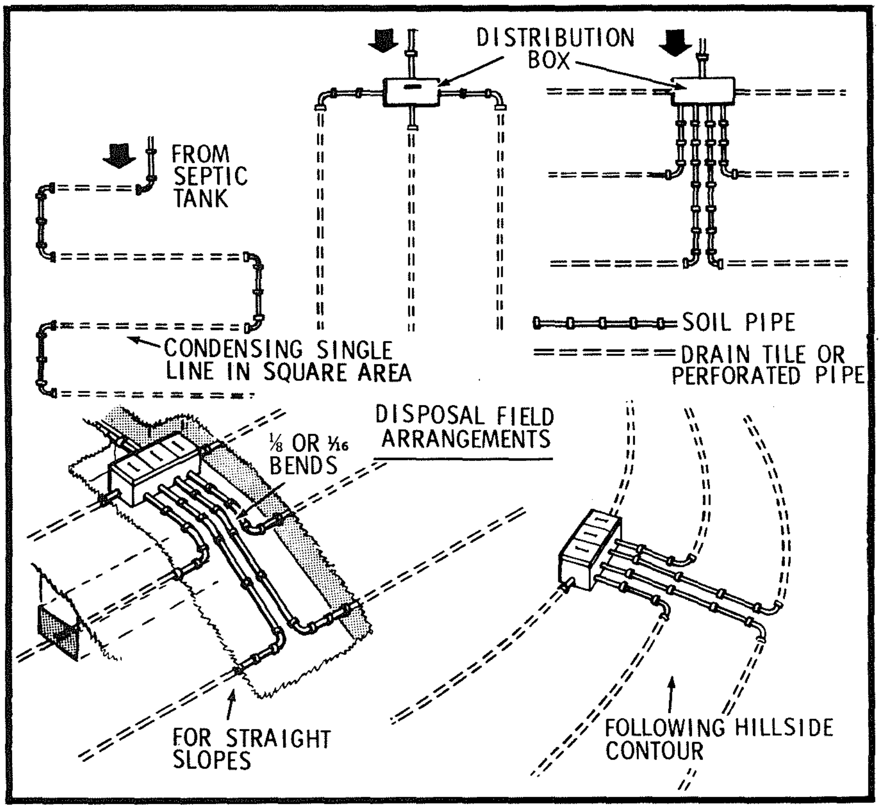
A single line should not exceed 100 ft. in length. Parallel lines should be spaced as in Table B. If there are two or more lines, a distribution box is needed to control the flow uniformly. It may be prefabricated or cast in concrete on the site. The outlets are at equal level just above the bottom. The cover should be removable, sealed and at least 8 in. below ground level. The pipe line from the septic tank to the distribution box and also those from the distribution box to the separate disposal lines should be soil pipe with leakproof joints. A gravel bed under this pipe is unnecessary but the pipe should have the same drainage slope as the disposal lines.

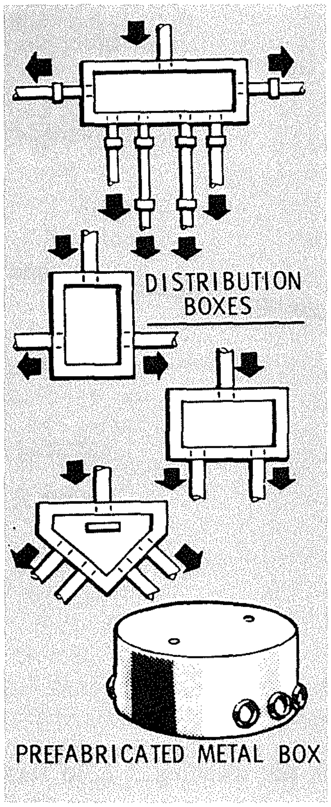
After the trenches are dug, 1 x 4 grade boards on which pointed stakes are nailed are located centrally in the trenches. The upper edge should be about 6 in. above the trench bottom and should have a drainage slope of ¼ in. per 8 lin. ft. The bottoms of the trenches are raked to a depth of 1 in. to eliminate smeared and compacted earth which interferes with absorption. Gravel or crushed stone (½ in. to 2½-in.) is laid on the bottom up to the top edge of the grade boards, which remain in place.

Next, 4-in. drain tile, or perforated pipe with holes down, is placed centrally on the boards while more gravel is added on either side and on top, enough to cover the pipe to a depth of at least 2 in. Joints between drainage tile should be open from ¼ in. to ½ in., and the top of each joint is covered with a piece of asphalt-impregnated paper or a sheet-metal cover. After the gravel is smoothed, it is covered with untreated building paper, or with a 2-in. layer of straw or hay. When refilling the trench, pile up a mound of earth 4 in. to 6 in. high to allow for settling, so no depression will form along the trench line.

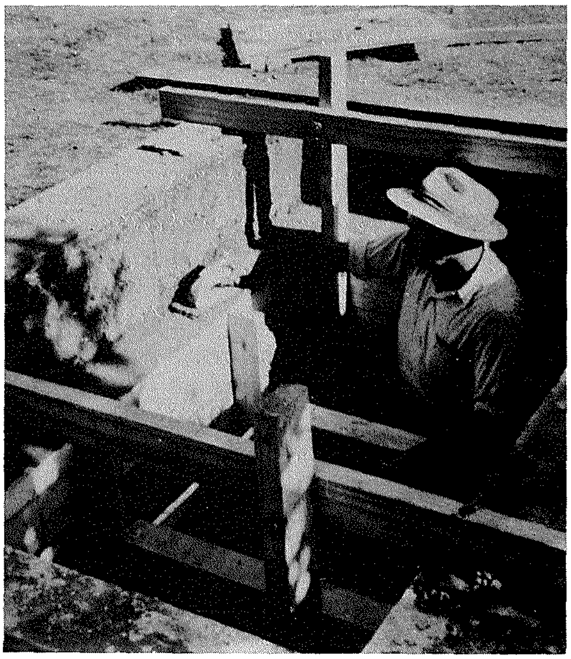
For sloping grades the disposal lines are laid at right angles to the direction of the slope if it is straight. Otherwise, the lines follow the ground contour. *A driveway should not be laid over any portion of the disposal field.* Drainage tile may be crushed by the weight of heavy vehicles. If the disposal field is on one side of a driveway and the septic tank on the other, the two should be connected with cast-iron pipe.

Septic tank: This may be a prefabricated steel tank suitably coated to prevent rusting; a prefabricated concrete tank having reinforced walls


DISTRIBUTION BOX
FROM SEPTIC TANK
CONDENSING SINGLE LINE IN SQUARE AREA
SOIL PIPE
DRAIN TILE OR PERFORATED PIPE
DISPOSAL FIELD ARRANGEMENTS
⅛ OR 1/16 BENDS
FOR STRAIGHT SLOPES
FOLLOWING HILLSIDE CONTOUR



septic system, continued



WHEN A SEPTIC TANK is cast on the site, the walls and bottom should be at least 6 in. thick and reinforced. Also, the inner surfaces must be completely waterproofed.

not less than 2½ in. thick; a concrete tank, cast on the site, having 6-in. reinforced walls and bottom; or a tank made of concrete blocks. The inside surfaces of the latter two should have a ¼-in.-thick coating of 1:2 portland cement-sand plaster, or other effective waterproofing.

Table C gives the required capacities of septic tanks based on the number of bedrooms. (The capacity of a tank is the volume below the liquid level.) These capacities allow for the disposal from garbage grinders, automatic washers and other common household appliances. It is best to have a tank that exceeds requirements, however, as fewer cleanings then will be necessary, which reduces maintenance cost.

A septic tank must be watertight. Cover slabs of 3-in. reinforced concrete are sealed with asphalt mastic or cement mortar to prevent the entrance of water or escape of gas. No vent is needed on the tank as the soil-pipe stack of the house serves this purpose.

The shape of a septic tank, whether square, rectangular or cylindrical, is of little importance. The top of the closed tank should come at least

8 in. below ground level. The outlet is provided with a tee, elbow or baffle extending below the liquid surface a distance of about 40 percent of its depth, for tanks having vertical sides, and about 35 percent for cylindrical tanks installed horizontally. For the former, the distance from the inside of the top to the liquid surface should be about 20 percent of the liquid depth, and for the latter this distance should be about 15 percent. The inlet should be at least 1 in. above the liquid surface, and preferably 3 in. A tee or baffle is provided to extend about 6 in. below the liquid surface to assure minimum disturbance from entering sewage. The upper end of the tee or baffle should be about 1 in. below the tank top to permit gas in the tank to escape through the house stack.

A single-compartment tank will give entirely satisfactory results, although a two-compartment tank (or two tanks connected) will be slightly more efficient. If a disposal system becomes too small to meet increased requirements, a second tank can be added and the size of the disposal field increased. The depth of the house sewer is determined after a septic tank has been installed. This pipe should have a cleanout opening at the house.

TABLE C
RECOMMENDED SIZE FOR SEPTIC TANKS

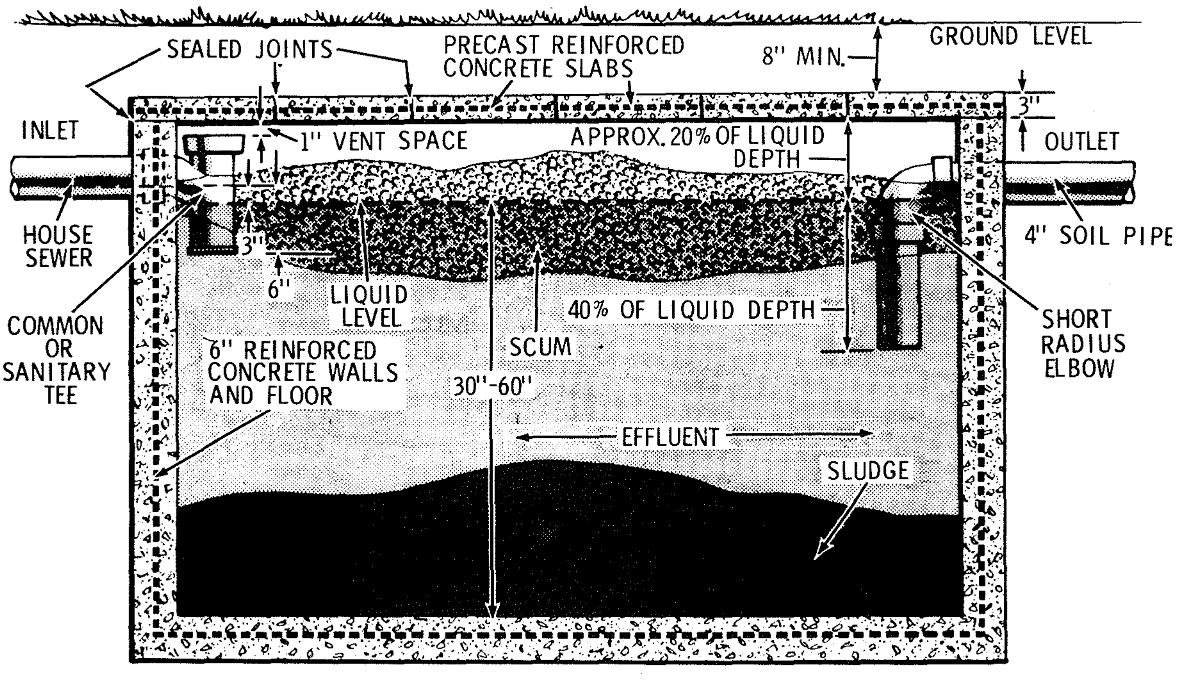
INCLUDES ALLOWANCE FOR GARBAGE GRINDER, AUTOMATIC WASHERS AND OTHER APPLIANCES

NUMBER OF BEDROOMS	MINIMUM CAPACITY (GALS.)	RECTANGULAR TANK SIZE(FT)			
		WIDTH INSIDE	LENGTH INSIDE	DEPTH INSIDE	LIQUID DEPTH
2 OR LESS	750	3½	7½	5	4
3	900	3½	8	5½	4½
4	1,000	4	8	5½	4½
5	1,250	4	9	5½	4½

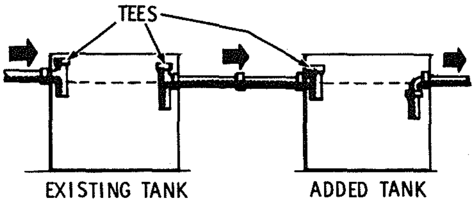
(1 CU. FT. VOLUME EQUALS 7.48 GALS.)

Maintenance: When first put into operation a septic tank does not require an additive such as yeast to start fermentation, although this may accelerate it. Septic-tank systems in constant use seldom freeze. Where winter temperatures are exceptionally low, protection can be provided with an adequate layer of straw, hay or snow. When the system is out of service for a period of time it is more susceptible to freezing. Clogging of disposal lines by roots occurs mostly in lines not having enough gravel under them. Usually the roots concentrate in the gravel.

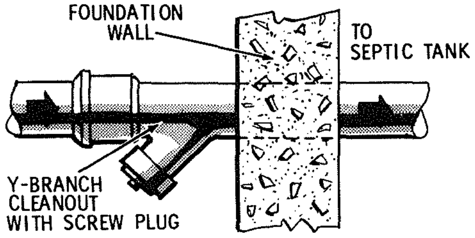
Soaps, detergents, bleaches, drain cleaners,



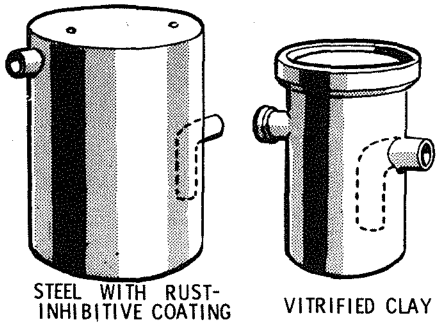
ESSENTIAL MEASUREMENTS AND PROPORTIONS FOR SEPTIC TANKS



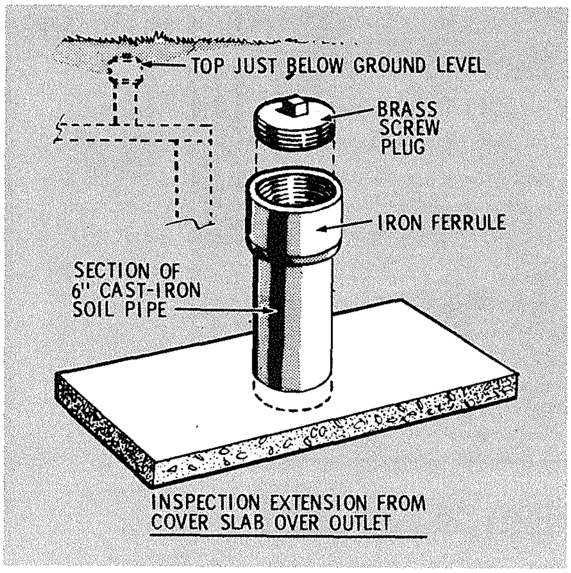
INCREASING CAPACITY OF SEPTIC TANK



CLEANOUT FOR HOUSE SEWER



PREFABRICATED GREASE TRAPS
(VARIOUS SIZES AVAILABLE)


TOP JUST BELOW GROUND LEVEL
BRASS SCREW PLUG
IRON FERRULE
SECTION OF 6" CAST-IRON SOIL PIPE

INSPECTION EXTENSION FROM COVER SLAB OVER OUTLET

disinfectants, fat, oil, grease, the discharge of a garbage grinder and of other common household appliances connected to the plumbing system—none of these will, in normal amounts, have any adverse effects on septic-tank disposal systems of the sizes given in the tables. Waste brines from water softeners also are not harmful in a septic tank, but they may shorten the life of the disposal field.

Chemicals not normally used in homes may cause trouble, so it is unwise to risk their disposal in a septic-tank system. These include chemicals used for photography or other hobbies and workshop activities. Substances not likely to decompose easily in a septic tank (toilet-paper substitutes, paper towels, newspapers, rags, etc.) should be disposed of elsewhere. Another thing to avoid is the introduction of large volumes of water, such as the drainage from roofs.

Where an excess of oil, fat and grease is anticipated, it is best to provide a grease trap. The grease is skimmed off the surface frequently so that only clear fluid will pass into the septic tank. With such an installation the discharge of a garbage grinder must not be passed into the grease trap but directly to the septic tank.

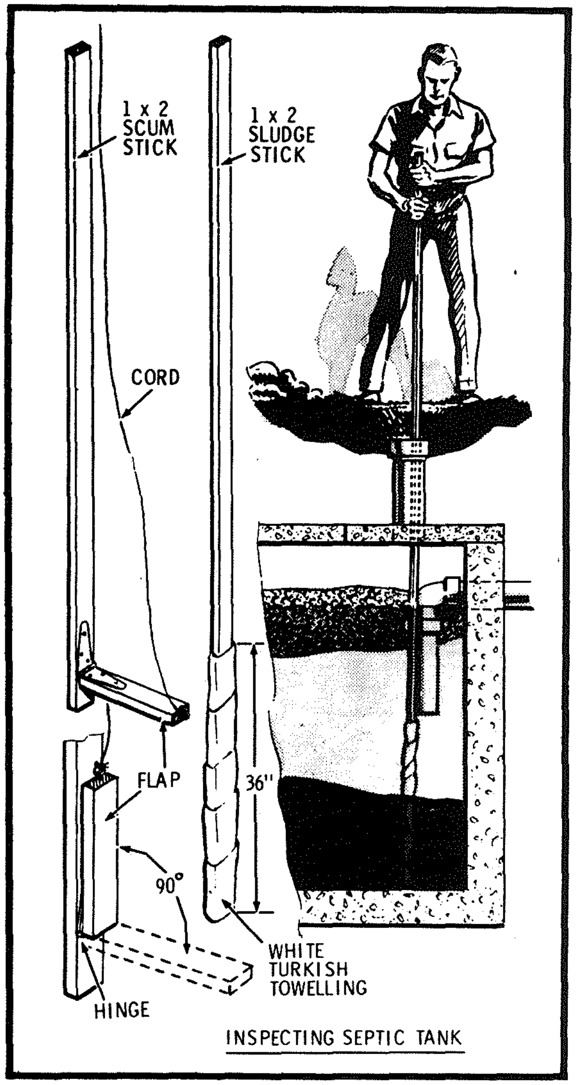
Many products, some containing enzymes, are being sold for the purpose of improving operation of septic tanks and to prevent or cure troubles. As far as is known, none of these products has proved of value in properly controlled tests, according to the U.S. Dept. of Health, Education and Welfare. Drain and septic-tank cleaners containing sodium hydroxide or potassium hydroxide should not be used too frequently nor in excessive amounts. (The above findings do not apply to chemicals designed to maintain soil porosity in disposal fields.)

The predominant reasons for trouble in septic-tank disposal systems are: (1) Lack of consideration for the percolation rate of the soil when installing a system; (2) level of ground water too high; (3) overloading the system with substances and chemicals that interfere with fermentation or reduce the absorptive quality of the soil in the disposal field; (4) failure to empty a septic tank when necessary, which allows solids to pass into the disposal field and clog it. When soil porosity of the disposal field is reduced for any of the above reasons the effluent can rise to the ground surface which causes an offensive odor and is a definite health hazard.

Flushing disposal lines with water sometimes gives temporary relief, but may not help at all. To remedy the condition in a disposal field of

TABLE D
ALLOWABLE SLUDGE ACCUMULATION

LIQUID CAPACITY OF TANK (GALLONS)	LIQUID DEPTH(FEET)		
	3	4	5
	DISTANCE FROM BOTTOM OF OUTLET TO TOP OF SLUDGE (INCHES)		
500	11	16	21
600	8	13	18
750	6	10	13
900	4	7	10
1,000	4	6	8



With two sticks you can measure accumulation of sludge to see if tank needs cleaning

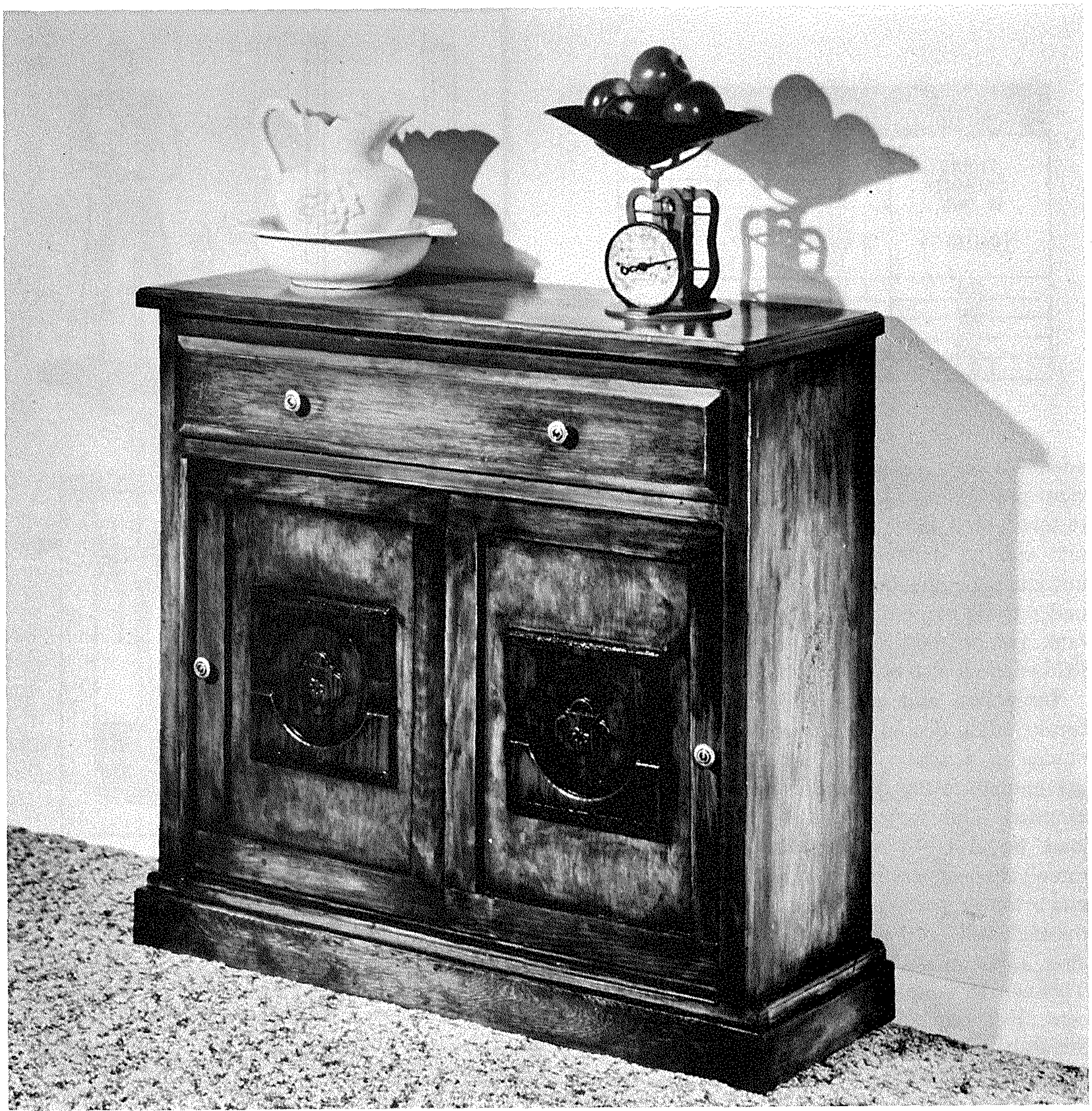
adequate size, and one that originally had sufficient percolation rate, the soil porosity must be restored or a new disposal field provided. The first can be done easily and economically by introducing emulsifiable chlorobenzine (available under trade name of Chloroben) into the septic tank and on the ground surface of the disposal field where it also helps to eliminate odor.

Inspection and cleaning: Although constant fermentation decomposes much of the scum and sludge in a septic tank, inert solids gradually accumulate to the point where the tank must be emptied. This varies considerably according to load. Some tanks will require cleaning within three years. Others may not require cleaning for much longer periods. To be sure that solids in the tank will not pass into the disposal field and clog it, an annual inspection is recommended. This can be done by a septic-tank cleaning concern. For homeowners who prefer doing this themselves, much unnecessary work can be avoided by providing an inspection outlet on the cover slab over the tank outlet. After uncovering this, allow gas in the tank to disperse by ventilation before inspection.

Avoid breathing the gas or igniting a match near it since the gas is both asphyxiating and explosive. Use a stick with a hinged flap to force it through the scum layer near the outlet. Let the flap drop to a horizontal position and then pull the stick up until you feel resistance of the scum layer. Then mark the stick at the top of the inspection outlet. Next, lower it again and pull it up against the lower end of the outlet elbow, tee or baffle, again marking the stick. The difference between the marks is the distance of scum to the outlet.

To measure the sludge thickness, wrap the end of a stick with rough, white toweling and tack it in place. Insert this through the hole previously made in the scum, and push the stick to the tank bottom, turning it as you would an auger. After a few minutes pull it up slowly so some sludge will remain on the toweling and so indicate the sludge thickness.

The tank should be emptied when the lower surface of the scum is about 3 in. above the bottom of the outlet, and as soon as the sludge comes within the limits given in Table D. Usually, tank cleaning is done by means of a tank truck equipped with a pump. An emptied tank should not be washed or disinfected; some of the sludge should be left to resume fermentation.



DRAWER SLIDES on single glide mounted on shelf center. Cabinet sides are let into the blind dadoes in top.

An early American server

This handsome period piece features 'trackless' bypassing doors that are flush when they're closed. It is great for storage and has an old-world antique look

By HARRY WICKS

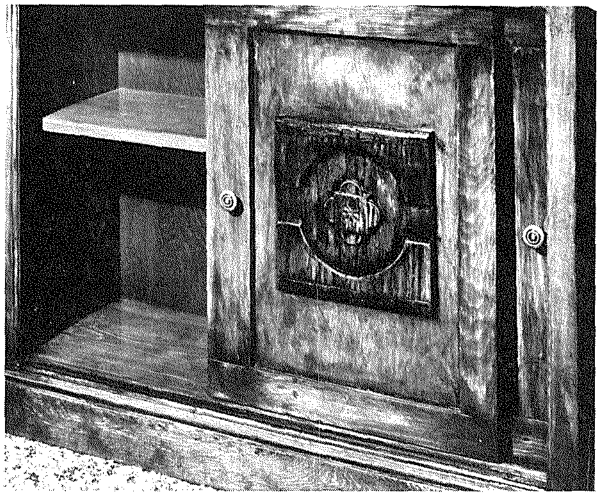
SEE ALSO

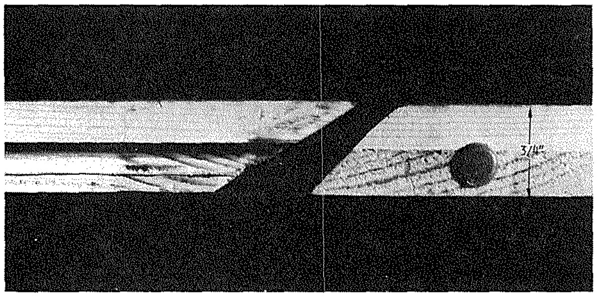
China cupboards . . . Drawers . . . Dry sinks . . . Gossip benches . . . Serving carts

■ THIS VERSION of an early American server is a handsome piece of furniture that offers well-organized storage space and occupies little floor area. It has the look of old-world craftsmanship.

Easy to build with power tools, the cabinet offers these advantages:

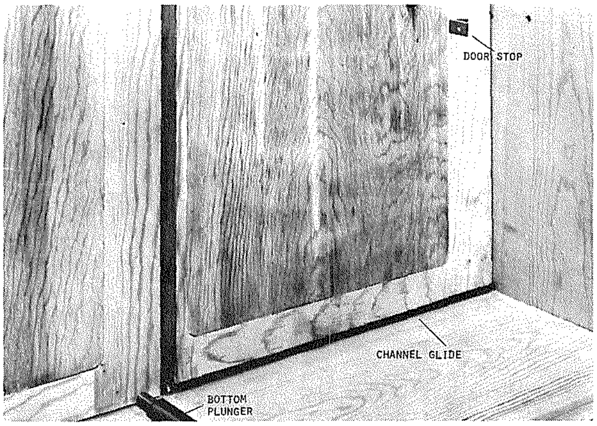
- Plaques "carved" of plastic look, and can be worked, like real wood.

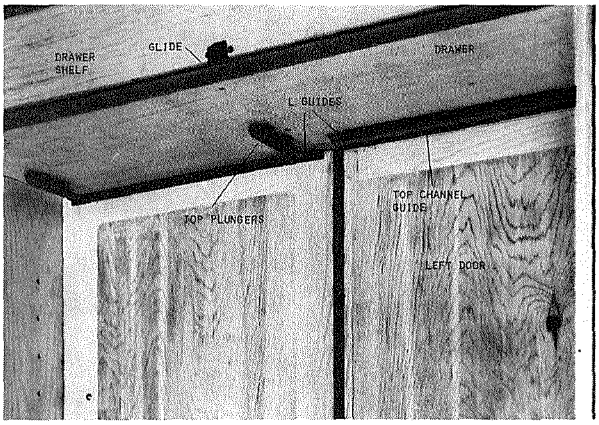




HOW THE HARDWARE WORKS . . .

SLIDING DOORS bypass with the left-hand door (facing the cabinet) always remaining in front, no matter which door is moved. Bottom view of doors (left) shows a groove needed for the track that goes on the left door. A plunger (below, left) and guide pin (not visible) are only hardware in the cabinet bottom. Left door slides on the pin, corner brace acts as a stop. Bottom view shows shelf bottom and hardware mounted in cabinet on doors. Glide on shelf is for the drawer.





- Hardware for bypassing doors is concealed (there's no bottom track to clean out) and places the doors in a flush position when they are closed.

In building the prototype, we made sure that all door stiles and rails would reveal 2 in. (in closed position). Thus, you'll notice in the drawing that these sizes vary because of the bevel cuts and the cabinet stiles and rails.

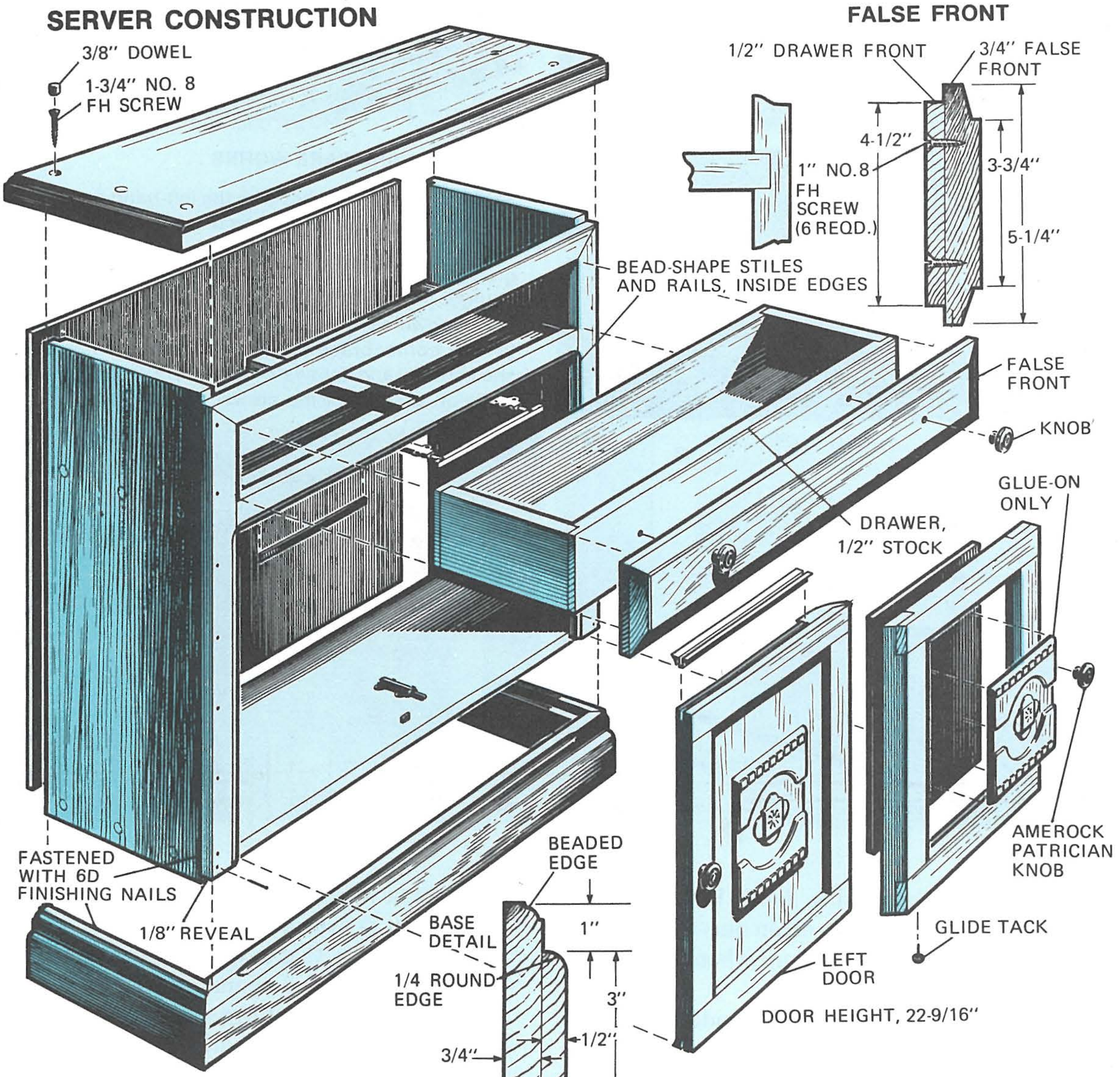
The cabinet. To start, cut all pieces to size. They'll make quite a pile, so label each piece lightly with a soft pencil for easy identification later. Make certain that you kerf the underside of the drawer shelf before you go farther. This kerf is needed for the top rail and, should you forget it, would be a time-consuming task by hand after the cabinet is assembled.

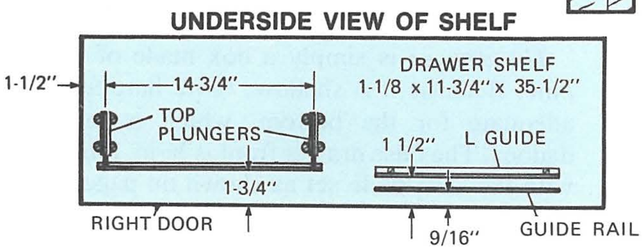
It is good practice to tack the pieces together temporarily, using diagonal braces on the back to keep it in square. When satisfied with cabinet fit, you can assemble the drawer and doors using the cabinet for final determination of their measurements.

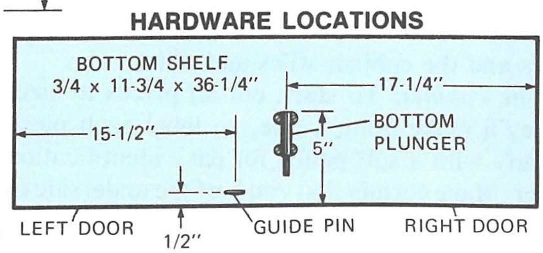
The drawer is simply a box made of ½-in. pine. Because it is shallow, ⅛-in. hardboard is adequate for the bottom, which is let into dadoes. The false drawer front is ¾-in. pine, and with the saw blade set as shown on page 2687, the raised panel is quickly made. Bevel ends first, then cut the lengths.

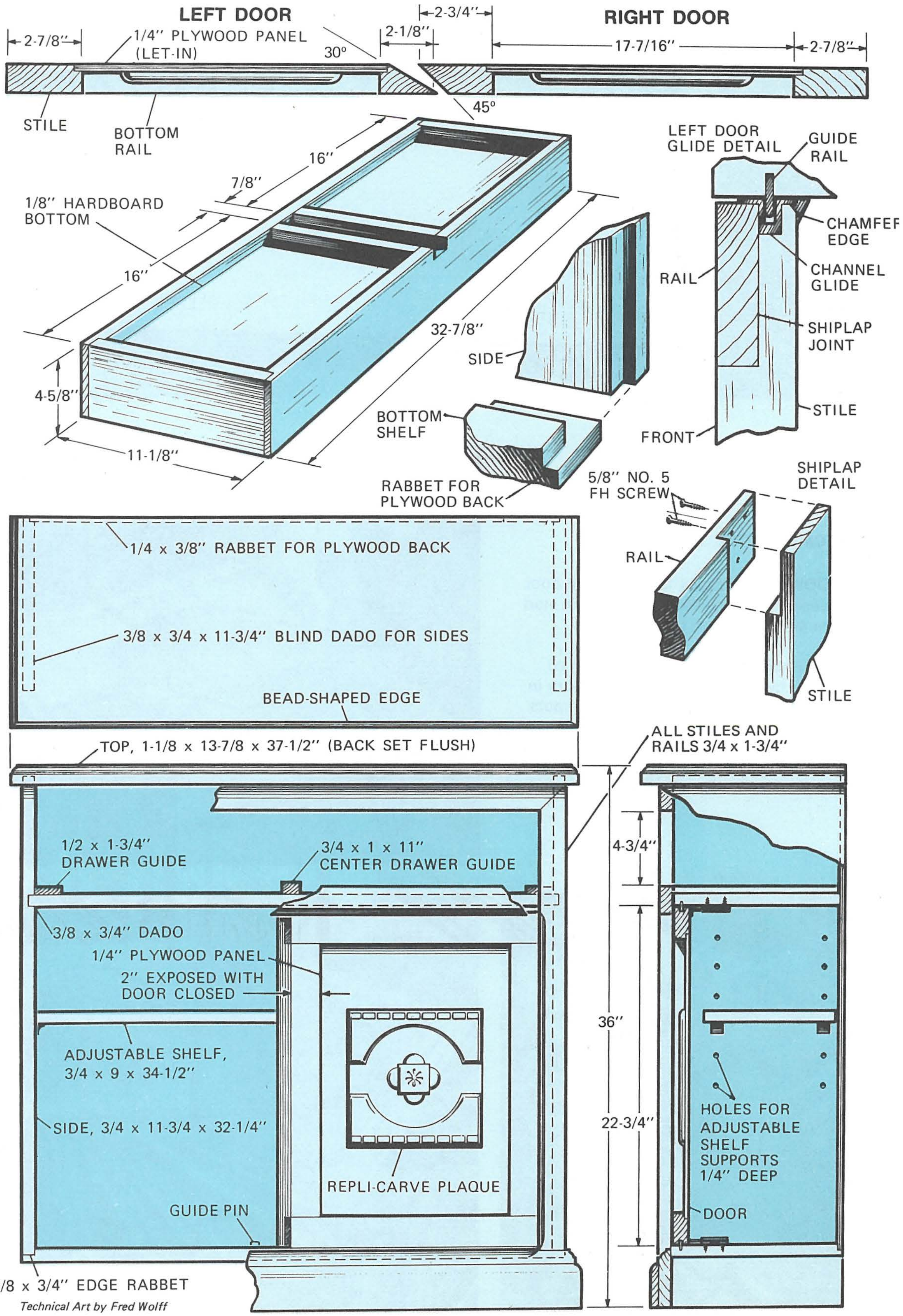
The doors are a little trickier, mostly because of the varying stile and rail widths. You may find it easiest to lay out both doors on the workbench and, after marking, shiplapping one stile or rail at a time. The ¼-in. plywood panels are let into a rabbet; the decorative plaques, glued to the fronts, are of molded plastic. Because the hardware will not permit a door thickness greater than ¾ in. (or the doors won't bypass), these had to be reduced in thickness. The plaques are attached with adhesive.

The hardware. You pay a slight price—in labor—for the beauty this hardware offers. It *is* harder to install than conventional sliding-door hardware and will likely call for a little trial-and-error fitting. The hardware package has a template. However, I found that once the cabinet was completely finished (varnished), a

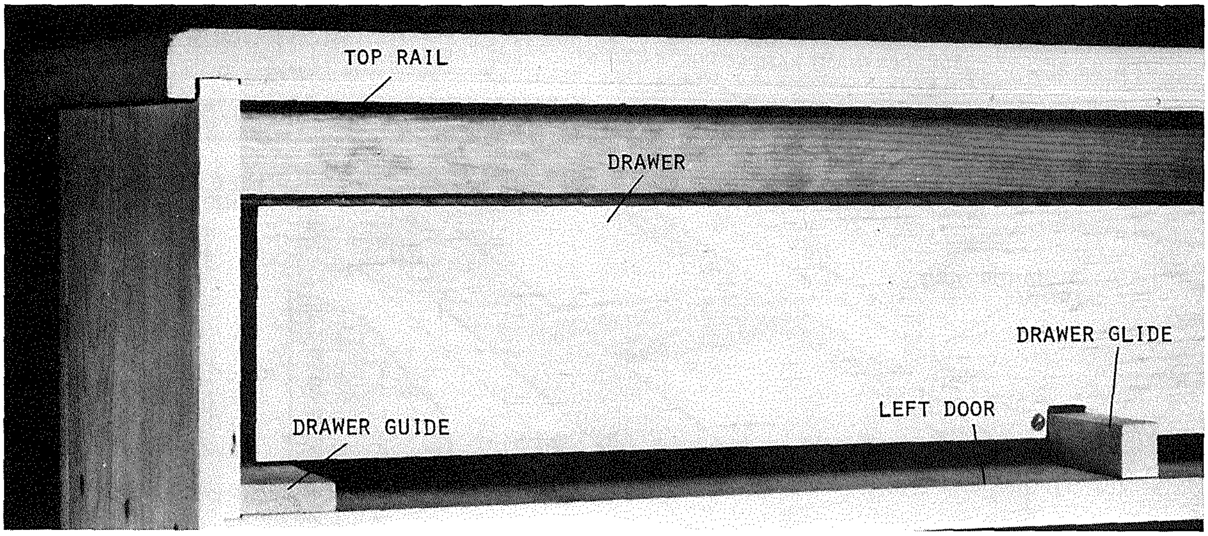








Technical Art by Fred Wolff

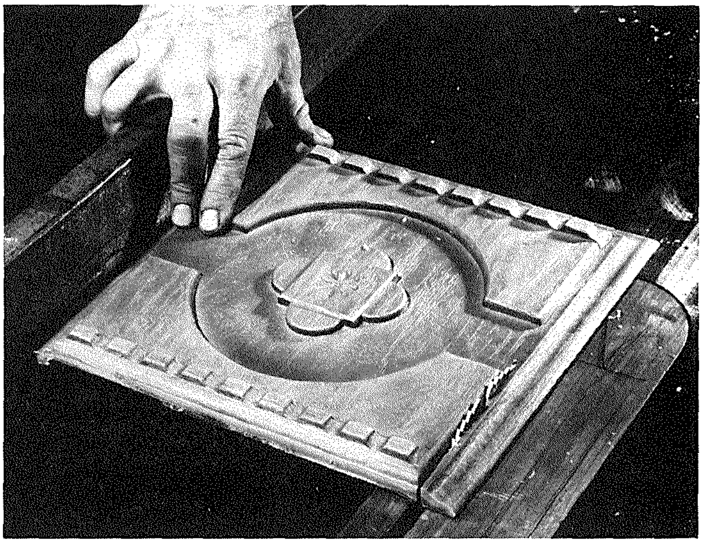


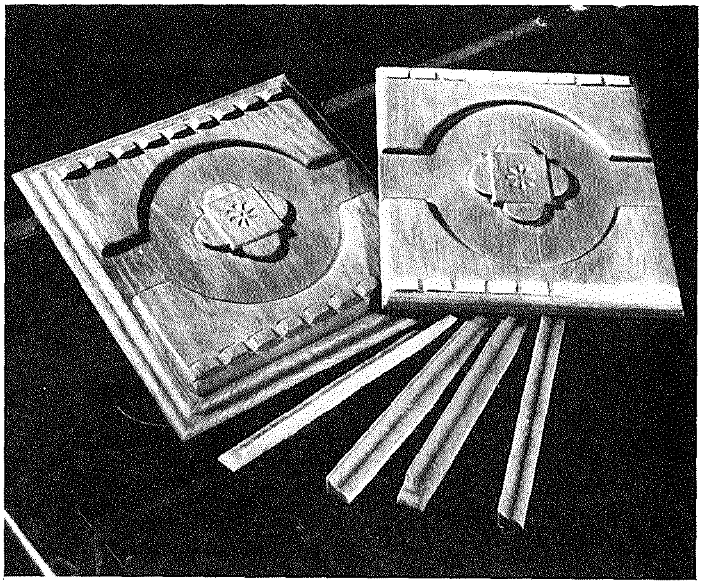
CUSTOMIZING THE PLAQUES

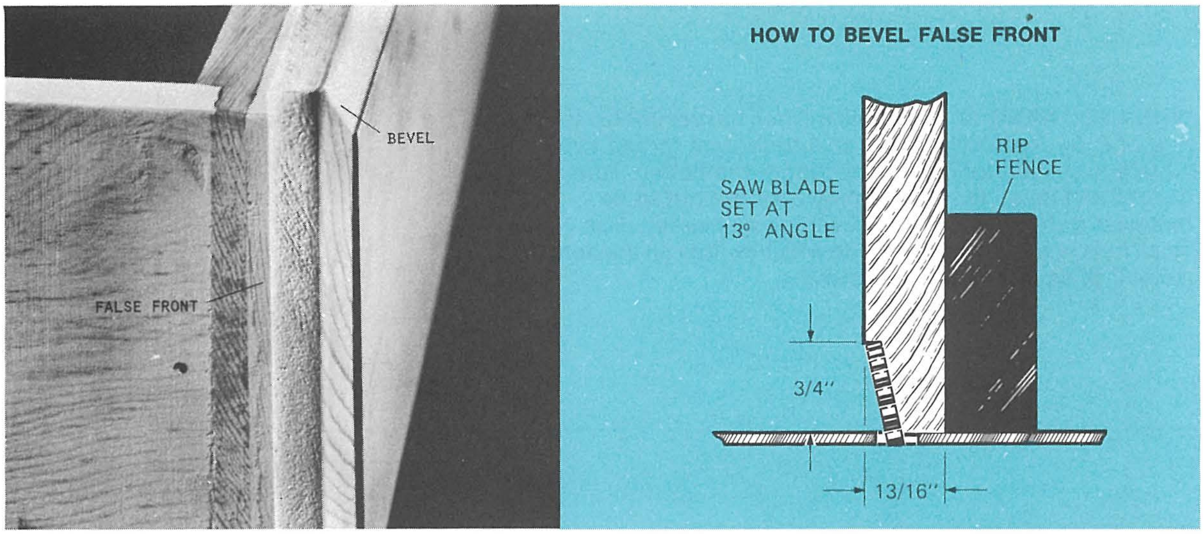
CUT DOWN the plaques to assure that door thickness will not exceed ¾ in. You can start by trimming four sides (right).

TRIM DECORATIVE nubs (below, left) so doors will bypass easily. When doors are in place, use belt sander to remove high spots.

PLAQUES, before and after trimming (below, right). Views of finished cabinet show that trimming doesn't hurt appearance.







RAISED-PANEL effect is easily accomplished on a table saw; false front is then glued to the drawer.

quick blast of spray silicone made the doors bypass effortlessly.

Assembly. The cabinet top and sides are assembled using screws and dowel plugs. All other assembly is accomplished with well-set finishing nails. The holes can be filled, but for an antique look, they were not on the server shown.

Finish. After thorough sanding, wipe the server with a tack cloth and apply oil stain. Wipe off excess stain and let dry overnight. Next day, antique the server using a tube of burnt umber and a rag to darken those areas that are dark on actual antiques. Use the rag to blend all dark spots into adjacent stain.

Coat the plaques with red enamel, allow to dry and antique the same way as before using a flat black enamel.

Finally, give the entire piece three coats of varnish. You can, if desired, let the final coat cure for three or four weeks and then apply Butcher's Wax.

MATERIALS USED IN PROJECT

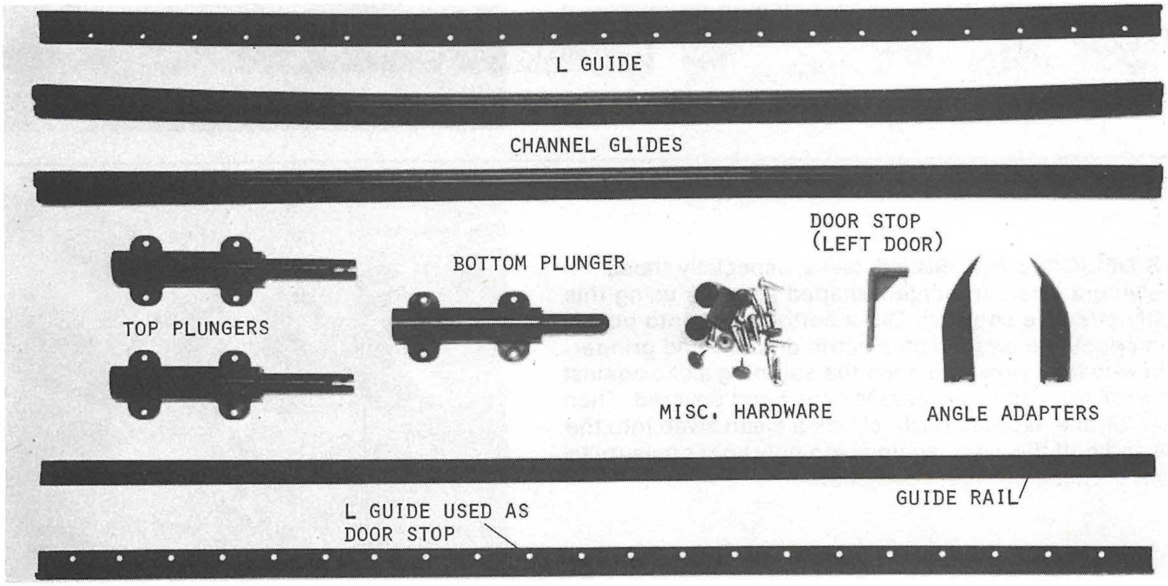
If not available locally, write to manufacturers for buying information.

Hardware: Bara Industries, Inc., Box 935, Somerville, NJ 08876.

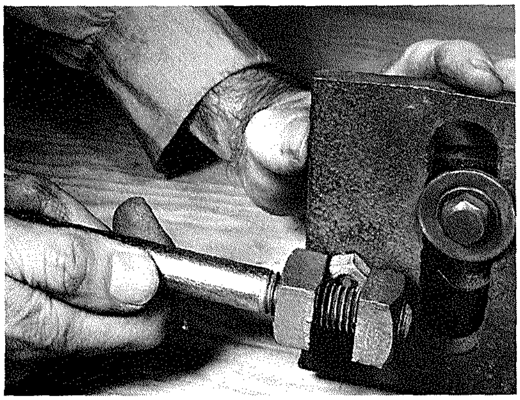
Plaques: Emco Repli-Carve, Box 864, New York Ave., Des Moines, IA 50304.

Finish: Pecan oil stain and Heirloom semigloss varnish, McCloskey Varnish Co., 7600 State Rd., Philadelphia, PA 19136.

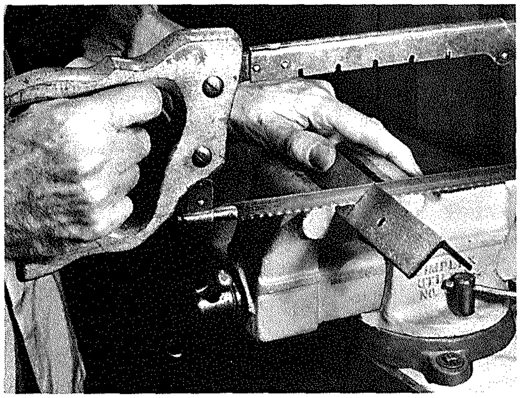
HARDWARE for the pair of sliding doors is shown below. It is also available for four-door cabinets.



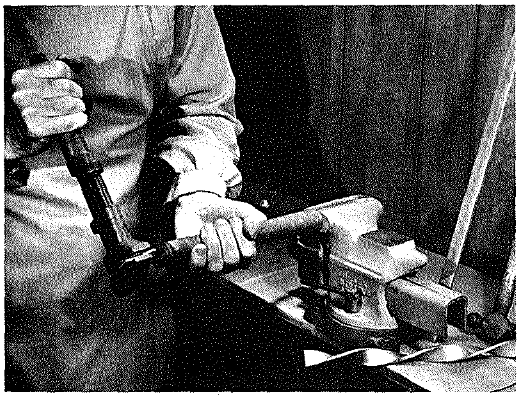
WHEN YOU NEED an adjustable wrench but are unable to find one, try improvising with this trick. Just thread two square nuts on a long bolt, the longer the better. Turn down the nuts so they slip tightly over the nut to be removed or tightened; apply leverage as needed. For small nuts you likely can make do with hex nuts on the bolt instead of square nuts (as shown).



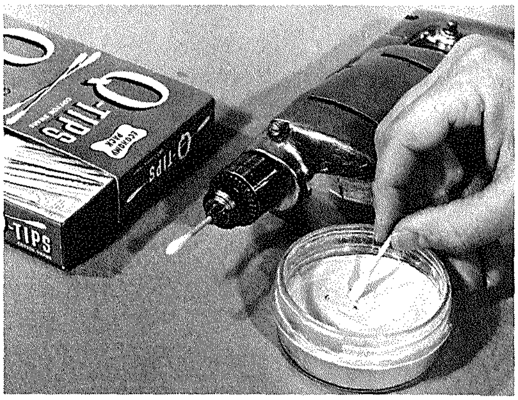
SAVE TIME by starting a hacksaw at the corner of a piece of angle iron instead of sawing down one leg and across the other. Obviously, fewer strokes of the saw are required to completely cut through the angle, thus saving time and labor. Another advantage, although not as obvious, is that the saw will cut more smoothly because more of the teeth will be engaged in cutting through both legs of the angle at the same time. Be sure, however, that the angle is firmly secured in a vise.



TO KEEP from producing undesired bends while twisting a piece of flat iron, slip it in a piece of pipe with a diameter slightly larger than the width of the strip of flat iron. Secure one end of the strip in a bench vise and grip the other end with a large monkey wrench. Twist slowly to spiral, but not kink, the strip. If the strip wedges inside the pipe, gently tap it out with a hammer. Alternatively, you could leave one end secured in the vise and tap off the pipe, instead of forcing the strip.



FOR DELICATE POLISHING tasks, especially those involving a small, intricately shaped area, try using this highly effective shortcut. Dip a cotton swab into polish, then chuck the swab in an electric drill or hand grinder. With very light pressure, feed the spinning swab against the work until all tiny recesses have been covered. Then clean off the excess polish, chuck a clean swab into the drill and buff the work, again using only light pressure to avoid breakage of the wood shaft.



METRIC CONVERSION

Conversion factors can be carried so far they become impractical. In cases below where an entry is exact it is followed by an asterisk (*). Where considerable rounding off has taken place, the entry is followed by a + or a - sign.

CUSTOMARY TO METRIC

Linear Measure

inches	millimeters
1/16	1.5875*
1/8	3.2
3/16	4.8
1/4	6.35*
5/16	7.9
3/8	9.5
7/16	11.1
1/2	12.7*
9/16	14.3
5/8	15.9
11/16	17.5
3/4	19.05*
13/16	20.6
7/8	22.2
15/16	23.8
1	25.4*

inches	centimeters
1	2.54*
2	5.1
3	7.6
4	10.2
5	12.7*
6	15.2
7	17.8
8	20.3
9	22.9
10	25.4*
11	27.9
12	30.5

feet	centimeters	meters
1	30.48*	.3048*
2	61	.61
3	91	.91
4	122	1.22
5	152	1.52
6	183	1.83
7	213	2.13
8	244	2.44
9	274	2.74
10	305	3.05
50	1524*	15.24*
100	3048*	30.48*

1 yard =
.9144* meters
1 rod =
5.0292* meters
1 mile =
1.6 kilometers
1 nautical mile =
1.852* kilometers

Fluid Measure

(Milliliters [ml] and cubic centimeters [cc or cu cm] are equivalent, but it is customary to use milliliters for liquids.)

1 cu in = 16.39 ml
1 fl oz = 29.6 ml
1 cup = 237 ml
1 pint = 473 ml
1 quart = 946 ml
= .946 liters
1 gallon = 3785 ml
= 3.785 liters
Formula (exact):
fluid ounces × 29.573 529 562 5*
= milliliters

Weights

ounces	grams
1	28.3
2	56.7
3	85
4	113
5	142
6	170
7	198
8	227
9	255
10	283
11	312
12	340
13	369
14	397
15	425
16	454

Formula (exact):
ounces × 28.349 523 125* =
grams

pounds	kilograms
1	.45
2	.9
3	1.4
4	1.8
5	2.3
6	2.7
7	3.2
8	3.6
9	4.1
10	4.5

1 short ton (2000 lbs) =
907 kilograms (kg)
Formula (exact):
pounds × .453 592 37* =
kilograms

Volume

1 cu in = 16.39 cubic centimeters (cc)
1 cu ft = 28 316.7 cc
1 bushel = 35 239.1 cc
1 peck = 8 809.8 cc

Area

1 sq in = 6.45 sq cm
1 sq ft = 929 sq cm
= .093 sq meters
1 sq yd = .84 sq meters
1 acre = 4 046.9 sq meters
= .404 7 hectares
1 sq mile = 2 589 988 sq meters
= 259 hectares
= 2.589 9 sq kilometers

Kitchen Measure

1 teaspoon = 4.93 milliliters (ml)
1 Tablespoon = 14.79 milliliters (ml)

Miscellaneous

1 British thermal unit (Btu) (mean)
= 1 055.9 joules
1 calorie (mean) = 4.19 joules
1 horsepower = 745.7 watts
= .75 kilowatts
caliber (diameter of a firearm's bore in hundredths of an inch)
= .254 millimeters (mm)
1 atmosphere pressure = 101 325* pascals (newtons per sq meter)
1 pound per square inch (psi) = 6 895 pascals
1 pound per square foot = 47.9 pascals
1 knot = 1.85 kilometers per hour
25 miles per hour = 40.2 kilometers per hour
50 miles per hour = 80.5 kilometers per hour
75 miles per hour = 120.7 kilometers per hour

METRIC TO CUSTOMARY

Linear Measure

millimeters (mm)	fractions of an inch (to nearest 1/64″)
1	3/64-
2	5/64+
3	7/64-
4	11/64-
5	13/64-
6	15/64+
7	17/64+
8	5/16+
9	23/64-
10	25/64+

Formula:
millimeters × .039 37 = inches

centimeters (cm)	inches (to nearest 1/64″)
1	25/64+
2	25/32+
3	1 3/16-
4	1 37/64-
5	1 37/32-
6	2 23/64+
7	2 3/4+
8	3 5/32-
9	3 35/64-
10	3 15/16-

Formula:
centimeters × .393 7 = inches

meters	feet (to nearest 1/4 inch)
1	3′ 3 1/4+″
2	6′ 6 3/4-″
3	9′ 10+″
4	13′ 1 1/2+″
5	16′ 4 3/4+″
6	19′ 8 1/4-″
7	22′ 11 1/2+″
8	26′ 3-″
9	29′ 6 1/4+″
10	32′ 9 1/2+″

Formula:
meters × 3.280 8 = feet
1 kilometer = 3280.839 8 feet
= .621 371 miles

Fluid Measure

1 milliliter (ml) = .034- oz (fluid ounces)
10 ml = .34- oz
100 ml = 3.4- oz
1 liter = 33.8+ oz
= 2 pints, 2- oz
= 1 quart, 2- oz

Formulas:
liters × 33.814 056 = ounces (fluid)
milliliters × .033 814 056 = ounces (fluid)

Weight

grams	ounces (avoirdupois)
1	.035+
10	.353-
50	1.76+
100	3.52-
500	1 lb 1.7- oz
1000	2 lb 3.3- oz

Formula:
grams × .035 273 99 = ounces (avoirdupois)

kilograms	pounds (to the nearest ounce)
1	2 lb 3+ oz
2	4 lb 7- oz
3	6 lb 9+ oz
4	8 lb 13+ oz
5	11+ lb
6	13 lb 4- oz
7	15 lb 7- oz
8	17 lb 10+ oz
9	19 lb 13- oz
10	22 lb 1- oz

Formula:
kilograms × 2.204 622 4 = pounds
1 metric ton (1000 kg) = 2 204.6 pounds

Volume

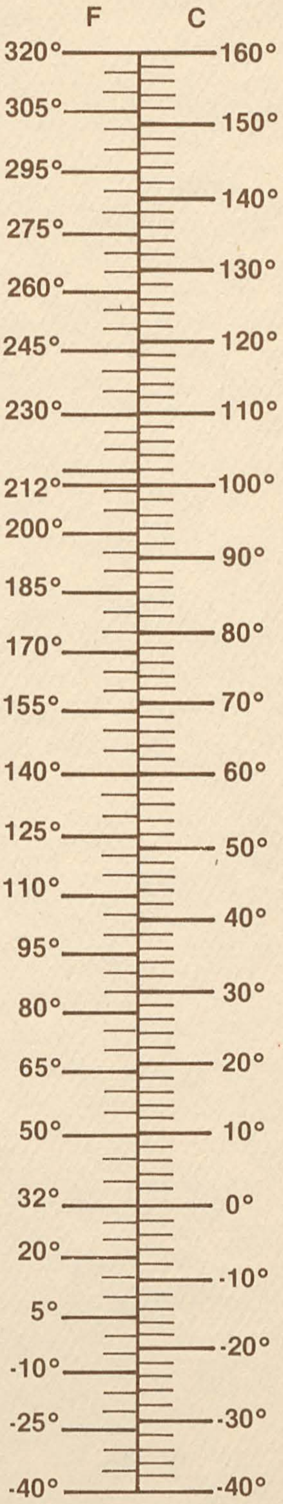
1 cubic centimeter (= 1 milliliter) = .061+ cubic inches
1 liter (1000 cc) = 61+ cubic inches
1 cubic meter = 35.3+ cubic feet

Area

1 square centimeter = .155 square inches
1 square decimeter = 15.5 square inches
1 square meter = 9.29 square feet
= .84- square yards
1 hectare (10 000 sq. meters) = 2.47+ acres

Miscellaneous

1 newton (N) = 4.45- pounds of force
1 pascal (Pa) (pressure) = .000 145 + psi
= .021- pounds per sq ft
1 kilopascal (kPa) = .145 + psi
= 21- pounds per sq ft
25 kilometers per hour (km/h) = 15.5 + mph
50 km/h = 31.1- mph
75 km/h = 46.6 + mph
100 km/h = 62.1 + mph
Formula:
km/h × .621 371 = miles per hour



32° Fahrenheit = 0° Celsius

0° Fahrenheit = -17.8° Celsius